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VORTAB — A DATA-TABLET METHOD OF DEVELOPING
INPUT DATA FOR THE VORLAX PROGRAM

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SUMMARY

A method of developing an input data file for use in the aerodynamic analysis of a complete airplane with the VORLAX computer program is described. Familiarity with VORLAX input data and panelling methods is assumed. The required hardware consists of an interactive graphics terminal equipped with a graphics tablet. Software includes graphics routines from the Tektronix PLOT 10 package as well as the VORTAB program described herein.

The user must determine the size and location of each of the major panels for the aircraft before using the program. Data is entered both from the terminal keyboard and the graphics tablet. The size of the resulting data file is dependent on the complexity of the model and can vary from ten to several hundred card images. After all of the data has been entered, two programs READB and PLOTB, are executed which plot the configuration allowing visual inspection of the model.

INTRODUCTION

To describe an aircraft configuration using the VORLAX aerodynamic computer program (ref. 1) a set of geometric data arranged in a specific format is required. At times it may be necessary to analyze an aircraft configuration for which the required numerical data is either nonexistent or in a form that is incompatible for use with the VORLAX program. In most cases, however, an aircraft three-view, drawn to scale, is available. Since a three-view drawing contains most of the required geometric data, it is a logical starting point from which to develop a numerical model.

Program VORTAB has been written to generate a VORLAX input data file from information obtained from the configuration three-view drawing. VORTAB permits the definition of as many major and minor panels as required to define the configuration within the limitations imposed by the VORLAX program. The types of panels that can be defined are cambered and uncambered flat panels, fuselage panels, and nacelle panels. Camber data cannot be determined with sufficient accuracy from the three-view drawing and must, therefore, be entered

in tabular form. The aircraft configuration is assumed to be symmetrical about its X-Z plane.

The procedure file PVORTAB (used to execute program VORTAB) and program VORTAB have been written to be used on the Langley Research Center CDC computers with the Network Operating System (NOS) and Tektronix Plot 10 graphics package. Langley Users may find the procedure file and computer program on access files under user number 214737C.

PROGRAM DESCRIPTION AND SAMPLE EXECUTION

A description and sample execution of each section of the program will now be presented, illustrated by copies of the terminal display during the execution and three-view drawings. In the illustrations of the screen display, several occurrences of question marks preceded by numbers will be found. At these points in the program, data is required from the graphics tablet. These numbers correspond to locations on the three-view drawings from which the required data are taken. The numbers are composed of two parts. The first refers to a figure number while the second refers to a point on that figure, for example 5-A refers to point A in figure 5; a point labeled 4b-C would refer to point C on figure 4b.

Figure 1 shows the first two steps in the execution of the program VORTAB. The first command gets procedure file PVORTAB

```
GET, PVORTAB/UN=214737C/ST=CPF
```

The second command executes the procedure file.

```
CALL, PVORTAB(NAME=EXAMPLE)
```

EXAMPLE is the name of the file on which the resulting data will be stored. Any desired name can be used in place of EXAMPLE.

Procedure File PVORTAB

Procedure file PVORTAB, listed in Appendix A, is used to get PLANE, which is the binary form of program VORTAB, and also ensures that the files onto which VORTAB writes will be empty before execution. The binary program PLANE

is then executed. After the execution is completed, the three output files are saved as one packed file, under the name specified in the call statement. Then the two binary programs, READB and PLOTB (ref. 2), are obtained from permanent file and executed. This causes the configuration to be plotted allowing the adequacy of the modeling to be determined.

Preparation and Use of the Three-View Drawing

Use of program VORTAB (Appendix B) requires access to an interactive computer graphics terminal equipped with a graphics tablet. Before the program can be used, a number of items must be prepared. This program is designed for use with a configuration three-view, drawn to scale. The three required views are a top view, with the nose to the left, a side view, with the nose to the left, and a front view (see fig. 2). The drawing may be placed on the tablet in one piece or it may be separated into two or three separate sections. To obtain the greatest accuracy, the drawing should be as large as possible while fitting on the usable portion of the tablet. The precise orientation of the three views, or of each of the separate views, is unimportant; however, a line that would be horizontal on any of the views should intersect the bottom of the tablet at an angle less than 45 degrees. The required configuration panels can be defined on either side of the aircraft X-Z plane, as symmetry is assumed, and all the panels will be stored in the VORLAX input data files assuming the right-hand side of the configuration. Lines which are hidden in the front view will present problems in locating some panels. If the front and side views are aligned properly, the vertical locations of the hidden front-view panels can be taken from the side view.

Organization of the VORTAB Program

The VORTAB program is organized into six sections. The first section is used to determine the orientation of each view of the configuration three view. This section also determines the scaling factor to be used to convert the data from tablet units into aircraft units. The second through fifth sections are used to define individual major panels. These panels are divided into four categories with one section of the program allocated for each. The categories

are; (1) wings and other flat panels that can have camber, (2) fuselage panels, (3) vertical flat panels, and (4) nacelle panels. As many panels as are needed to define the various configuration components may be defined with program VORTAB providing the limitations imposed by the VORLAX program are observed. The final section of the program is used to enter numerical data. These data have two purposes: to enter instructions used in processing the configuration, and to enter certain parameters that are used to define the configuration.

After all of the data has been entered it is stored on disc in a permanent file. The name of the file is specified in the call to procedure file PVORTAB. After the data has been saved, two programs from PLOTIT (ref. 2) are executed which results in a plot of the aircraft configuration. This permits visual inspection of the resulting model.

Initialization of the Program

After the initial data and drawing preparation and before the program can be used to define the various configuration panels, a set of eight points must be entered to initialize the program. These points are used by the program to determine the location and orientation of each of the three configuration views. This section of the program requests the position of the two points called center leading point and center trailing point. These two points will always lie in the configuration plane of symmetry. If an odd number of fuselages are present, the center leading and trailing points are the nose and tail points of the central fuselage. If an even number of fuselages are present, the center leading point is the midpoint of a line joining the nose points of the two most central fuselages, and the center trailing point is the midpoint of a line joining the tail points of these same two fuselages. In a configuration that has no fuselage, e.g., a flying wing, the center leading and trailing points are taken as the leading and trailing point of the wing centerline.

The screen display which is generated during the initialization is shown in figure 3(a), and the curser locations are shown in figure 3(b).

First the orientation of the top-view is determined, by sending the locations of the central leading point (3b-A) and the central trailing point (3b-B) to the computer. The distance between these points in aircraft units is then typed in at the keyboard. The front-view is initialized next by specifying two points on a line parallel to the Y-axis, 3b-C and 3b-D, and the central leading point 3b-E. The sideview is initialized last, by specifying two points on a line parallel to the X-axis, 3b-F and 3b-G, and the central leading point 3b-H.

Defining an Aircraft Configuration

For this discussion, aircraft configurations will be divided into three categories, aircraft with one fuselage, with an even number of fuselages, and with an odd number of fuselages greater than one. The following describes the order in which the panels are to be defined for each of the three cases.

Single fuselage. - For a configuration with one fuselage, the panels are defined in the following order: wing panels (as many as necessary), other winglike or flat panels, fuselage panels, vertical panels and, finally, nacelles.

Even number of fuselages. - If a configuration has an even number of fuselages, the first panels to be defined are the innermost wing panels followed by the innermost fuselage and continuing outward. After all of the wings and fuselages have been defined, the other winglike panels are defined, followed by vertical panels and nacelles.

Odd number of fuselages. - When a configuration has an odd number of fuselages greater than one, the first panels to be defined are the wing panels between the central fuselage and the next outward fuselage. The central fuselage will then be defined, followed by the next outward fuselage. The other wing panels and fuselages are then defined continuing outward. After all of the wings and fuselages are defined, other winglike and flat panels can be defined followed by vertical panels and nacelles.

Description of Lifting Surfaces

The first type of panel to be considered is the wing. Other panels such as canards and filler panels are special cases of wings. In the program these are called flat panels. If no panels of this type are needed, this section of the program can be bypassed. There is a separate section within the program to handle panels parallel to the plane of symmetry.

The first question which appears in figure 4(a) asks if flat panels are to be defined. If so, the first panel is assumed to be the innermost wing panel.

Location. - To define a flat panel, a set of six points is required from the graphics tablet as shown in figure 4(b). They are the root leading point (4b-A), root trailing point (4b-B), the vertical location of the topmost point of the panel root (4b-C), the panel tip leading point (4b-D), tip trailing point (4b-E), and the topmost point of the panel tip (4b-F). The required numerical data, entered through the keyboard, is shown in figure 4(a).

Camber. - Horizontal panels can be either cambered or uncambered. If they are uncambered, this section of the program will be skipped. In the case of the wings, if the innermost wing panel is cambered all of the connected wing panels will be cambered. Distances from the leading edge for camber data can be defined in one of two ways, either as percent chord or linear measurement. If the data is entered in linear units, the program converts them to percent chord. In both cases the data is entered from the keyboard, and data for both the leading and trailing edges must be included. The camber values themselves are always input in units of percent chord.

When the locations are defined in terms of percent chord as in figure 4(c), the data must be entered in sets of three numbers, the percent chord station, the camber at the root-chord line, and the camber at the tip-chord line. Data must be included for stations at zero percent chord and at 100 percent chord. Up to 50 stations may be used. After all of the camber data has been entered a set of any three numbers must be entered, the first of which must be negative, to terminate the definition of camber data.

When the locations are defined in terms of linear measurement, figure 4(d), all of the data for the panel root is entered first. The numbers are entered in pairs, the first of which is the distance from the leading edge while the second is the camber. The first pair must be for the leading edge while the last must be for the trailing edge.

After the required data has been entered, two additional numbers must be transmitted, the first of which is negative. This instructs the program that no more data is to be entered for the panel root. Data is then entered for the panel tip, in the same manner as for the root. If a flat panel is to be uncambered, the display will appear as it does in figure 4(e).

Error recovery. - Because the possibility exists that errors will be made while entering panel data, the last question displayed on the terminal display asks if the panel just defined is wanted.

Additional flat panels. - After the first horizontal panel has been accepted, the Tektronix screen will appear as is shown in figure 4(f). Three options for the continuation of the program are offered at this point. The first, selected by entering an E, allows an extending panel to be added to the previously defined panel. If the previous panel was cambered, the extending panel must be cambered; if the previous panel was uncambered, the extending panel must be uncambered. The second option, selected by entering a N, makes it possible to define an entirely new panel. The final choice, selected by entering a Q, causes the program to proceed to the next type of panel. After each flat panel other than the first has been accepted or rejected, the display will appear as it does in figure 4(g).

Description of Fuselage Panels

Any number of fuselage panels can be defined within the limits imposed by the VORLAX program. Each of the fuselages is assumed to have an octagonal cross-section and may be composed of up to four major panels.

The cross-section of the fuselage is initially assumed to be circular and is approximated by a regular octagon. This octagon is then modified so that the vertex nearest the wing root will be in contact with the wing root.

This allows fuselages with a noncircular cross-section to be approximated by an irregular octagon. The numerical data required for a fuselage is entered through the keyboard and is shown in figure 5(b).

The first question, asked in figure 5(a), makes it possible to define an aircraft either with or without a fuselage. The first points entered in the definition of a fuselage are the nose point from the top-view, 5c-A, and from the side-view, 5c-B, as shown in figure 5(c).

The next points, from the side-view, are entered in pairs, one from the top and one from the bottom of the fuselage with the bottom point directly below the top point. The pairs of points are shown as 5c-C-N and 5c-D-N, where N is the pair number. As many pairs as required can be entered within the limits of the VORLAX program. After the last desired pair of points has been entered, the program will again ask for a top point. At this point a Q should be entered which indicates that all of the point pairs have been entered. At this time it is possible to reenter the data if an error has been made. The desired number of fuselage panels is then specified up to a maximum of four. Each panel consists of an octagonal segment of a fuselage. The length of each segment, other than the one which ends at the tail point of the fuselage, is specified by entering its end points from the tablet. An example of such a point is 5c-E.

The next data to be entered are the number of streamwise vortices. If an error has been made, the next question allows the panel to be rejected and the length and number of vortices to be redefined. If the fuselage was located at the center of the configuration the program will ask, IS ANOTHER FUSELAGE DESIRED? This would be the second fuselage of a multi-bodied configuration with an odd number of fuselages.

Description of Vertical Panels

A vertical panel is one which is parallel to the plane of symmetry, e.g., a fin or rudder. A vertical panel could also be defined in the section of the program used to define flat panels. The purpose of this section is to simplify the definition of vertical surfaces and avoid problems caused by

hidden lines.

The questions which appear on the screen during definition of a vertical panel are shown in figure 6(a). The first question allows the user the option of either defining or not defining vertical panels.

Four points are required from the side-view: the bottom leading point (6b-A), the bottom trailing point (6b-B), the top leading point (6b-C), and the top trailing point (6b-D). One additional point is required from the top view (6b-E) and is used for spanwise location only. The numerical data which is required are the numbers of spanwise and streamwise vortices. At this point the panel can be rejected if errors have been made while defining it. The final question, DO YOU WANT ANOTHER VERTICAL PANEL?, allows additional vertical panels to be defined.

The fifth section of the program is used to define nacelles which are represented as uncambered hollow octagonal cylinders. Figure 7(a) shows the terminal display which results from the definition of a nacelle. The first question allows this portion of the program to be skipped.

The first two points are taken from the top view and are the two front corners of the nacelle, points 7b-A and 7b-B. The next points, also from the top-view, are taken from one side of the nacelle and are labeled C1 through Cn. These points are used to determine the relative diameters of the nacelle in the streamwise direction. The last of these points must come from one of the two rear corners to determine the nacelle length. A Q is sent to the program to indicate that the last of these points have been entered. The final point, from the front-view, is the topmost point of the nacelle (7b-D). The number of streamwise vortices must be entered through the keyboard. A nacelle can be rejected if an error is made in entering the data. Additional nacelles can be defined if necessary.

Numerical Data

This section of the program is used to enter parameters which define some aspects of the aircraft configuration and its operating conditions. It is arranged to correspond to cards in the VORLAX (ref. 1) input data deck

with the associated card numbers. Most of the parameters which must be entered in this section have names in parentheses which are the same as the names used in reference 1. The card number and variable name can be used to look up an explanation of the variables which is more extensive than that which appears in this program. After all of the data for a card has been entered, the program asks if the data is to be reentered for that card. This allows erroneous data to be corrected. Data for any card can be reentered as many times as necessary.

Figure 8(a) shows a possible screen display generated while entering data for the first six cards. Figures 8(b) and 8(c) show two possible screen displays generated while entering data for the last three VORLAX data cards.

With the termination of this section of the program, execution of program VORTAB is complete.

GRAPHIC OUTPUT

At this point procedure file PVORTAB will execute programs READB and PLOTB which plot the aircraft configuration.

Using figure 2 as a sample configuration, program VORTAB was used to generate the numerical data shown in figure 9. Utilizing the plotting routines of reference 2, various views of the configuration have been plotted and are shown in figure 10.

REFERENCES

1. Miranda, Luis R.; Elliot, Robert D.; and Baker William M.: A Generalized Vortex Lattice Method for Subsonic and Supersonic Flow Applications. NASA CR-2865, December 1977.
2. Denn, Frederick M.: PLOTIT - Method of Interactively Plotting Input Data for the VORLAX Computer Program. NASA CR-158896, June 1978.

```
/GET,PUORTAB/ST=CPF/UN=214737C.  
/CALL(PUORTAB(NAME=EXAMPLE))
```

Figure 1. - Required two statements to retrieve and execute program VORTAB from mass storage.

[illegible]

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```

FROM THE TOP VIEW
CENTER LEADING POINT
3b-A ?
CENTER TRAILING POINT
3b-B ?
    INPUT THE LENGTH OF THE FUSELAGE (A NUMBER).
    ? 100
    THREE POINTS FROM THE FRONT VIEW ARE ENTERED NEXT.
    FIRST POINT AND SECOND POINT REFER TO 2 POINTS ON
    A LINE PARALLEL TO THE Y-AXIS.

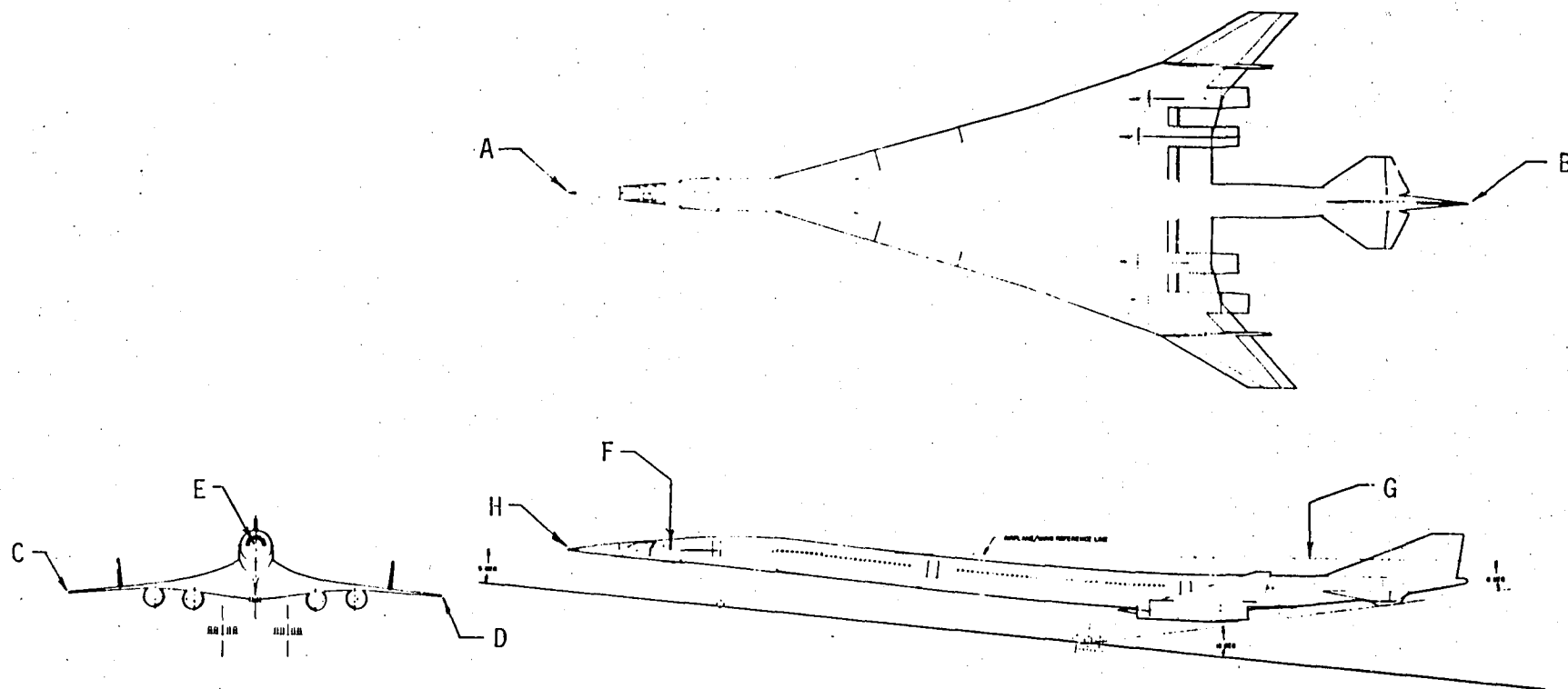
    FIRST POINT
3b-C ?
    SECOND POINT
3b-D ?
    CENTER LEADING POINT
3b-E ?
    THREE POINTS FROM THE SIDE VIEW ARE ENTERED NEXT
    FIRST POINT AND SECOND POINT REFER TO TWO POINTS ON
    A LINE PARALLEL TO THE X-AXIS.

    FIRST POINT
3b-F ?
    SECOND POINT
3b-G ?
    CENTER LEADING POINT
3b-H ?

```

(a) Display of messages necessary in the initialization process.

Figure 3. - Program VORTAB initialization process.



(b) Curser locations required in the initialization process.

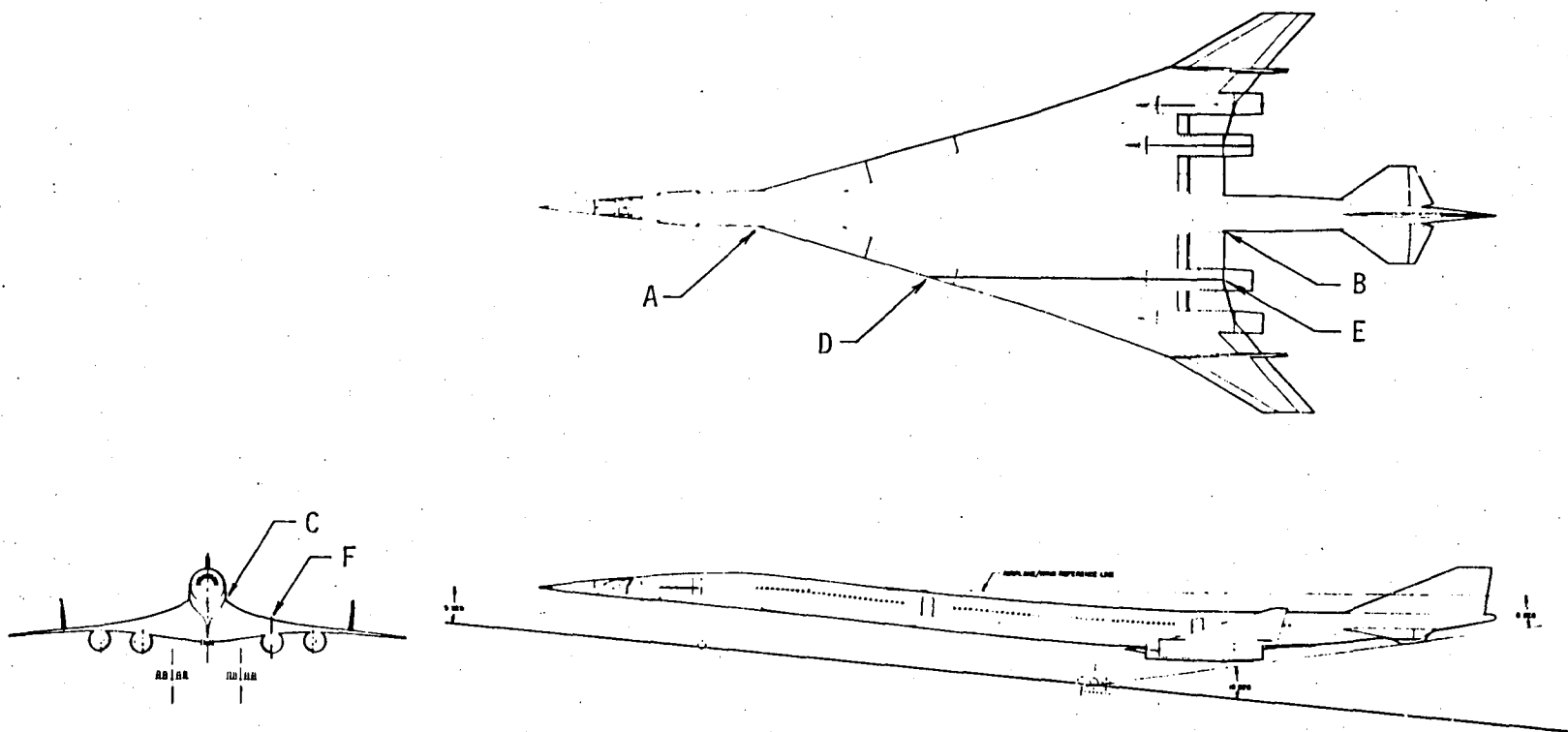
Figure 3. - Concluded.

ARE FLAT PANELS DESIRED
 ENTER Y OR T FOR YES, OR N OR F FOR NO
 ? T
 THE FIRST PANEL IS A WING ATTACHED TO THE FUSLAGE.

ROOT LEADING POINT (FROM THE TOP VIEW)
 ?
 4b-A ROOT TRAILING POINT (FROM THE TOP VIEW)
 ?
 4b-B ENTER WING/CANARD EDGE POINT (FROM THE FRONT VIEW)
 ?
 4b-C OUTER LEADING POINT (FROM THE TOP VIEW)
 ?
 4b-D TIP TRAILING POINT (FROM THE TOP VIEW)
 ?
 4b-E ENTER WING/CANARD EDGE POINT (FROM THE FRONT VIEW)
 ?
 4b-F NUMBER OF SPANWISE VORTICES (NVOR)
 ? 3
 NUMBER OF STREAMWISE VORTICES (RNCU)
 ? 9
 LEADING EDGE SUCTION MULTIPLIER (SPC) 0.0<=SPC<=1.0, OR
 SPCC0.0 FOR POLHAFUS ANALOGY
 ? 0
 ENTER THE ANGLE OF THE ROOT CHORD LINE (IN DEG.)
 A POSITIVE ANGLE CAUSES A DEFLECTION DOWN.
 ? 0
 ENTER THE ANGLE OF THE TIP CHORD LINE (IN DEG.)
 ? 0

(a) Display of messages necessary in defining a flat panel.

Figure 4. - Definition of a wing.



(b) Curser locations required in defining a flat panel.

Figure 4. - Continued.

```

DO YOU WANT CAMBER IN THE PANELS
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y
CAMBER IS ENTERED IN X-CHORD OR LINEAR MEASURE.
DO YOU WANT CAMBER IN X-CHORD
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y
INPUT CAMBER DATA BELOW.
INPUT PERCENT CHORD < 0.0 TO STOP
% CHORD,      ROOT CAMBER,      & TIP CAMBER
? 0.0,0      ROOT CAMBER,      & TIP CAMBER
? 5.1,4.3,3.1  ROOT CAMBER,      & TIP CAMBER
? 10.0,6.0,5.0  ROOT CAMBER,      & TIP CAMBER
? 20.5,4      ROOT CAMBER,      & TIP CAMBER
? 40.4,3.      ROOT CAMBER,      & TIP CAMBER
? 70.2,1      ROOT CAMBER,      & TIP CAMBER
? 100,1,1     ROOT CAMBER,      & TIP CAMBER
? -1,2,3
DO YOU WANT THE PREVIOUS PANEL
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y

```

(c) Display of messages necessary in defining panel camber in percent chord.

Figure 4. - Continued.

```

DO YOU WANT CAMBER IN THE PANELS
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y
CAMBER IS ENTERED IN X-CHORD OR LINEAR MEASURE.
DO YOU WANT CAMBER IN X-CHORD
ENTER Y OR T FOR YES, OR N OR F FOR NO
? N
INPUT CAMBER DATA BELOW
TO STOP INPUT DISTANCE FROM LEADING EDGE < 0.0
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? 0.0
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? 4.3,3
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? 10,3
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? 30,1.5
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? 50,.1
ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER.
? -1,1
STATION NUMBER 1
ENTER DIST. FROM LEAD. EDGE & TIP CAMBER.
? 0.0
STATION NUMBER 2
ENTER DIST. FROM LEAD. EDGE & TIP CAMBER.
? 2.15,2.3
STATION NUMBER 3
ENTER DIST. FROM LEAD. EDGE & TIP CAMBER.
? 5,2
STATION NUMBER 4
ENTER DIST. FROM LEAD. EDGE & TIP CAMBER.
? 15,.75
STATION NUMBER 5
ENTER DIST. FROM LEAD. EDGE & TIP CAMBER.
? 25,.0
DO YOU WANT THE PREVIOUS PANEL
ENTER Y OR T FOR YES, OR N OR F FOR NO
? N

```

(d) Display of messages necessary in defining panel camber in linear measurements.

Figure 4. - Continued.

DO YOU WANT CAMBER IN THE PANELS
 ENTER Y OR T FOR YES, OR N OR F FOR NO
 ? F
 DO YOU WANT THE PREVIOUS PANEL
 ENTER Y OR T FOR YES, OR N OR F FOR NO
 ? T

(e) Display of messages necessary if a flat panel is not cambered.

ONE OF THREE POSSIBILITIES MUST BE CHOSEN NEXT,
 (1) A PANEL CAN BE ADDED TO THE OUTER EDGE OF THE
 PREVIOUS ONE (I.E. A MULTI-PANELED UING),
 (2) AN ENTIRELY NEW FLAT PANEL CAN BE ENTERED,
 (3) THE NEXT TYPE OF PANEL CAN BE ENTERED.
 FOR AN EXTENDING FLAT PANEL INPUT...E (EXTENDING).
 FOR A NEW FLAT PANEL INPUT.....N (NEW PANEL).
 TO STOP FLAT PANELS INPUT.....Q (QUIT).

(f) Display of choices after the first horizontal panel has been accepted.

FOR AN EXTENDING FLAT PANEL INPUT...E (EXTENDING).
 FOR A NEW FLAT PANEL INPUT.....N (NEW PANEL).
 TO STOP FLAT PANELS INPUT.....Q (QUIT).
 ? Q

(g) Display of choices for subsequent horizontal panels.

Figure 4. - Concluded.

DO YOU WANT A FUSELAGE
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y

5C-A ? ENTER NOSE POINT FROM TOP VIEW

(a) Display of message necessary in defining a fuselage.

Figure 5. - Definition of a fuselage.

TO MAKE A FUSELAGE BODY ENTER POINTS FROM THE SIDE VIEW. THE NOSE POINT IS FIRST. THE NEXT POINTS ARE ENTERED IN PAIRS, THE FIRST FROM THE TOP OF THE FUSELAGE, THE SECOND FROM THE BOTTOM DIRECTLY BELOW THE FIRST. THE LAST TWO COME FROM THE END OF THE FUSELAGE, AFTER THESE TWO ENTER Q TO END

```

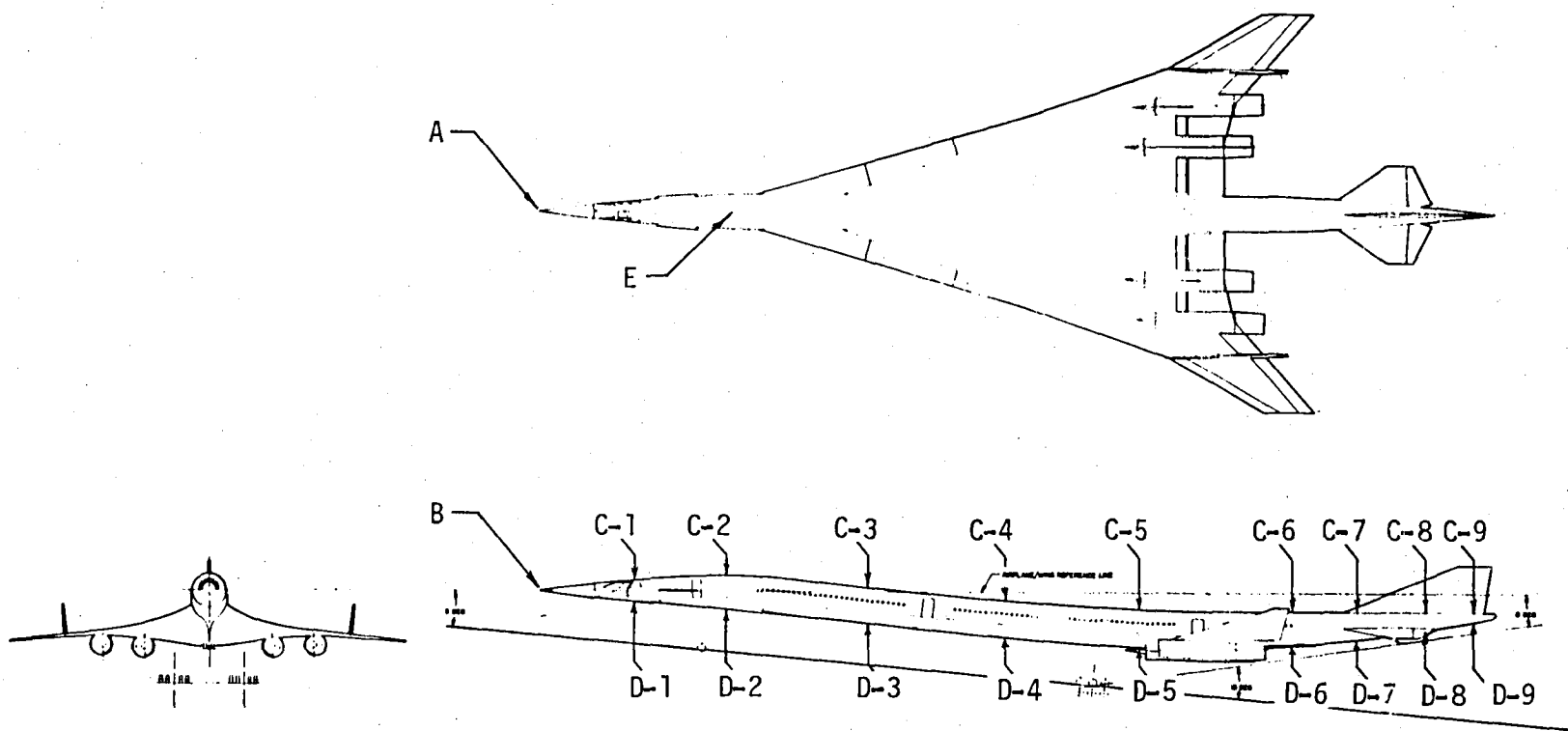
5c-B   NOSE POINT
        TOP POINT
5c-C-1 ? BOTTOM POINT
5c-D-1 ? TOP POINT
5c-C-2 ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
        ? TOP POINT
        ? BOTTOM POINT
5c-C-9 ? TOP POINT
5c-D-9 ? TOP POINT
        ? Q
        DO YOU WANT TO RE-ENTER THIS DATA
        ENTER Y OR T FOR YES, OR N OR F FOR NO
        ? N
        NUMBER OF FUSELAGE PANELS
        ? 2
        ENTER BREAK POINT FOR PANEL 2 , (FROM THE TOP VIEW)

5c-E   ?
        NUMBER OF CHORDWISE VORTICIES (RNCV)
        FOR PANEL NUMBER 1
        ? 12
        DO YOU WANT THE PREVIOUS PANEL
        ENTER Y OR T FOR YES, OR N OR F FOR NO
        ? Y
        NUMBER OF CHORDWISE VORTICIES (RNCV)
        FOR PANEL NUMBER 2
        ? 12
        DO YOU WANT THE PREVIOUS PANEL
        ENTER Y OR T FOR YES, OR N OR F FOR NO
        ? Y
        IS ANOTHER FUSELAGE REQUIRED
        ENTER Y OR T FOR YES, OR N OR F FOR NO
        ? Y

```

(b) Display of messages necessary in defining a two panel fuselage.

Figure 5. - Continued.



(c) Curser locations required in defining a fuselage.

Figure 5. - Concluded.

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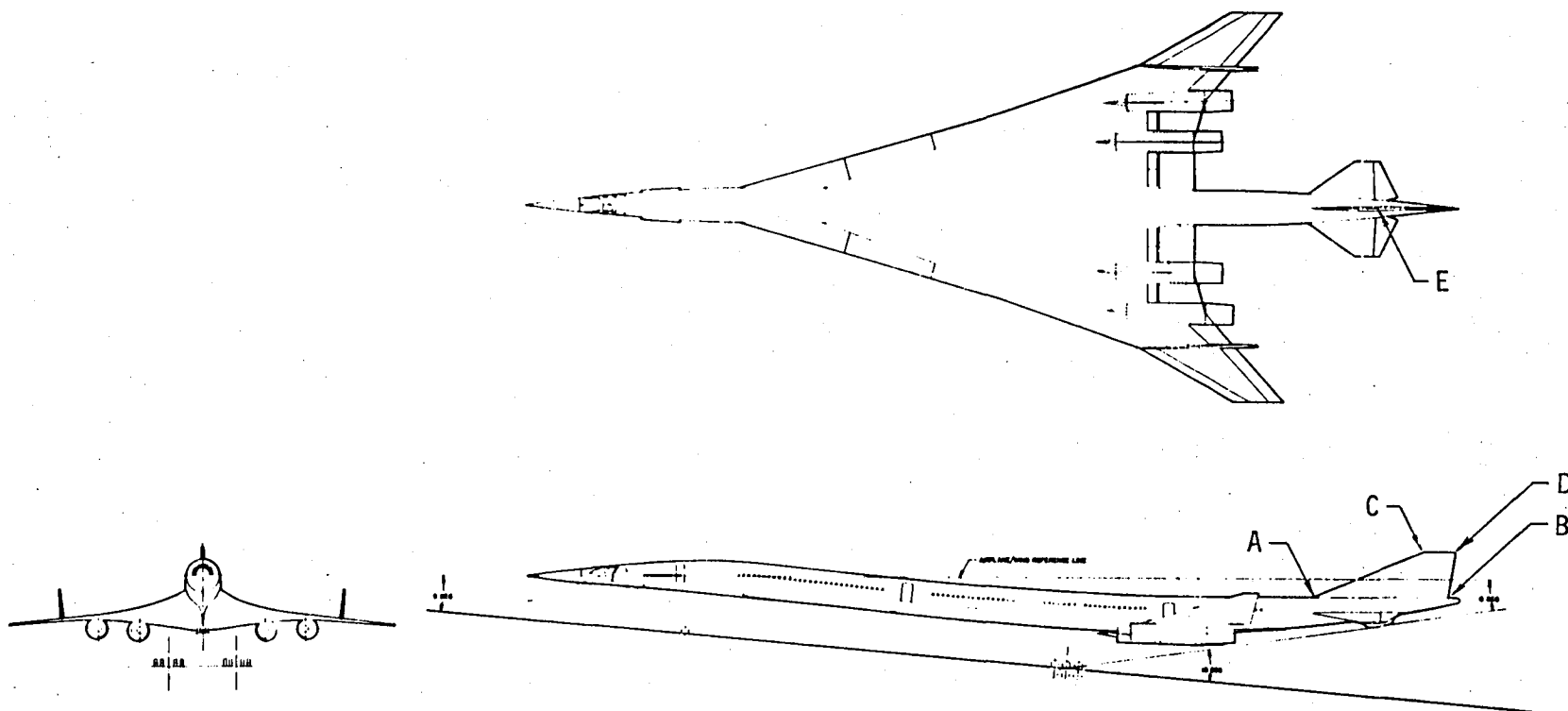
DO YOU WANT VERTICAL PANELS
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y

BOTTOM LEADING POINT (FROM THE SIDE VIEW)
?
6b-A ?
BOTTOM TRAILING POINT (FROM THE SIDE VIEW)
?
6b-B ?
TOP LEADING POINT (FROM THE SIDE VIEW)
?
6b-C ?
TOP TRAILING POINT (FROM THE SIDE VIEW)
?
6b-D ?
A POINT FOR SPANWISE LOCATION (FROM THE TOP VIEW)
6b-E ?
NUMBER OF SPANWISE VORTICES (NVOR)
? 2
NUMBER OF STREAMWISE VORTICES (RNCU)
? 9
DO YOU WANT THE PREVIOUS PANEL
ENTER Y OR T FOR YES, OR N OR F FOR NO
? T
DO YOU WANT ANOTHER VERTICAL PANEL
ENTER Y OR T FOR YES, OR N OR F FOR NO
? F

```

(a) Display of messages necessary in defining vertical panels.

Figure 6. - Definition of a vertical surface.



(b) Curser locations required in defining a typical vertical panel.

Figure 6. - Concluded.

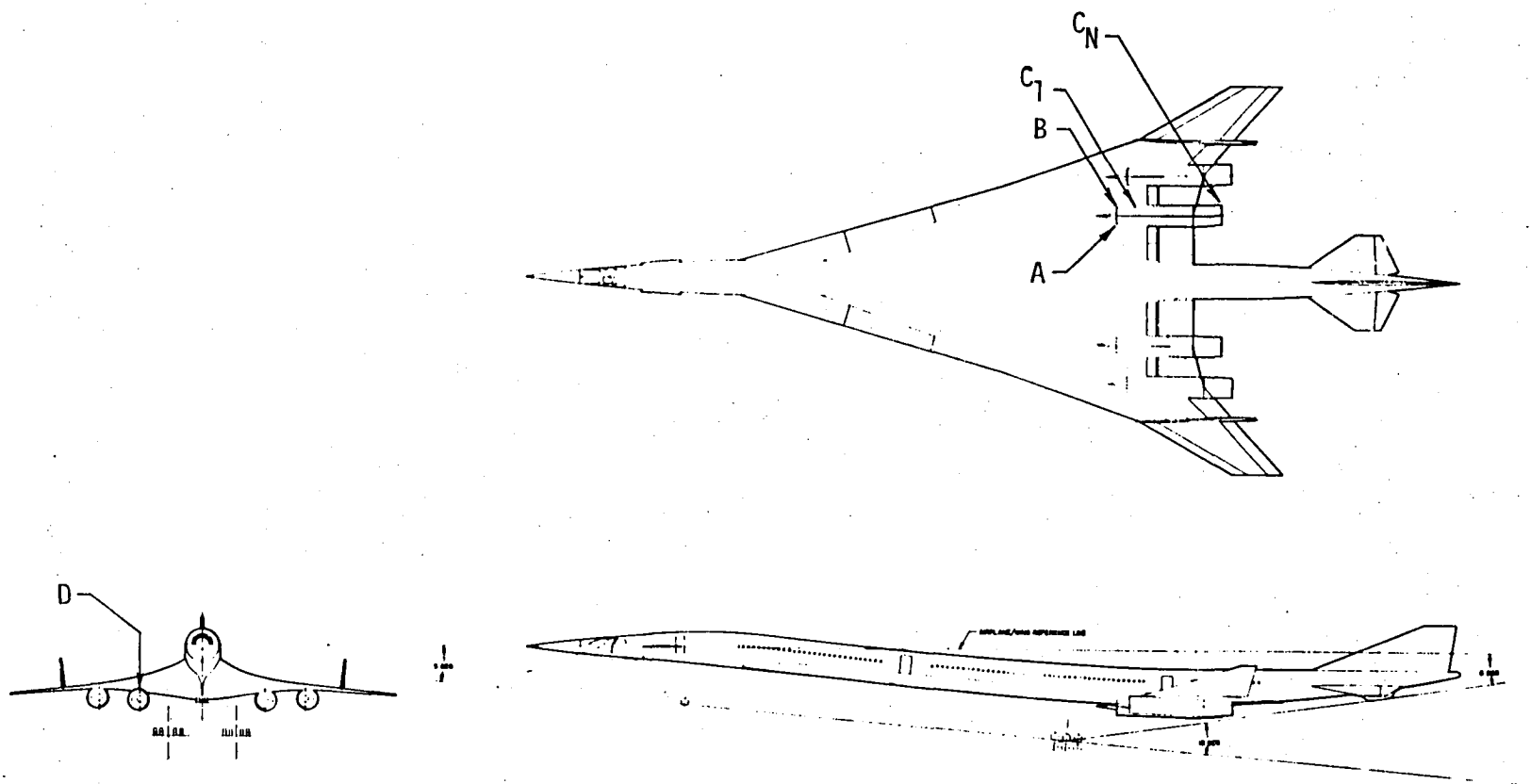
```

DO YOU WANT NACELLES
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y
FROM THE TOP VIEW
INNER OR OUTER FRONT NACELLE POINT
7b-A ?
REMAINING FRONT NACELLE POINT
7b-B ?
ENTER BODY POINTS ALONG ONE SIDE (EXCLUDING FRONT
POINTS). PROGRESSING FROM FRONT TO REAR AFTER THE
LAST POINT HAS BEEN PROCESSED ENTER @ FOLLOWED BY
A CARRIAGE RETURN.
7b-C N ? @
TOP NACELLE POINT (FROM THE FRONT VIEW)
7b-D ?
NUMBER OF CHORDWISE VORTICES (RNCV)
? 9
DO YOU WANT THE PREVIOUS PANEL
ENTER Y OR T FOR YES, OR N OR F FOR NO
? Y
IS ANOTHER NACELLE DESIRED
ENTER Y OR T FOR YES, OR N OR F FOR NO
? N

```

(a) Display of messages necessary in defining a nacelle.

Figure 7. - Definition of a nacelle.



(b) Curser locations required in defining a nacelle.

Figure 7. - Concluded.

THE CARD NUMBERS CORRESPOND TO THE CARD NUMBERS
AS GIVEN IN THE DOCUMENT FOR THE VORLAX PROGRAM.
ENTER THE DATA FOR CARD NUMBER 1.
ENTER TITLE FOR THE AIRCRAFT CONFIGURATION
? THIS IS A SAMPLE EXECUTION
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 1
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? T
ENTER THE DATA FOR CARD NUMBER 1.
ENTER TITLE FOR THE AIRCRAFT CONFIGURATION
? THIS IS STILL A SAMPLE EXECUTION.
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 1
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 2.
METHOD OF SOLVING THE SYSTEM OF EQUATIONS RELATING
BOUNDARY CONDITIONS TO VORTICITY STRENGTH (ISOLVE)
0 FOR GAUSS-SEIDEL
1 FOR PURCELL'S VECTOR ORTHOGONALIZATION
? 0
CHORDWISE SPACING OF VORTICES (LAX)
0 FOR COSINE LAW SPACING
1 FOR LINEAR SPACING
? 1
SPANWISE SPACING OF VORTICES (LAY)
0 FOR COSINE LAW SPACING
1 FOR LINEAR SPACING
? 0
INPUT THE OVER-RELAXATION PARAMETER (REXPAN)
INPUT 0.0 FOR MACHINE DETERMINED OPTIMUM
0.0 <- REXPAN < .00
? .10
HEIGHT ABOVE GROUND (HAG),
ENTER 0.0 FOR NO GROUND EFFECT
? 0
LONGITUDINAL VORTEX WAKE FLOTATION FACTOR (FLOATX)
? .75
LATERAL VORTEX WAKE FLOTATION FACTOR (FLOATY)
? .63
MAXIMUM NUMBER OF ITERATIONS FOR THE GAUSS-SEIDEL
RELAXATION METHOD (ITRMAX)
IF 0 IS ENTERED DEFAULT OF 99 WILL BE USED
? 3
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 2
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 3.
NUMBER OF MACH NUMBERS TO BE ANALYZED (NMACH)
<-7
? 1

INPUT MACH NUMBER 0 1
? 1.1
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 3
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 4.
NUMBER OF ANGLES OF ATTACK (NALPHA)
<-7
? 2
INPUT ANGLE 0 1 IN DEGREES
? 3.2
INPUT ANGLE 0 2 IN DEGREES
? 4.
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 4
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 5.
ASYMMETRIC FLIGHT OR CONFIGURATION FLAG (LATRAL)
0 FOR SYMMETRIC FLIGHT AND CONFIGURATION
1 FOR ASYMMETRIC FLIGHT AND/OR CONFIGURATION
? 1
SIDESLIP ANGLE IN DEGREES (PSI)
? 2
PITCH RATE IN DEGREES/SECOND (PITCHQ)
? 3
ROLL RATE IN DEGREES/SECOND (ROLLQ)
? 4
YAW RATE IN DEGREES/SECOND (YAWQ)
? 5
REFERENCE FREE STREAM VELOCITY (UINF)
IF 0.0 IS ENTERED DEFAULT OF 1.0 IS USED
? 0
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 5
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 6.
REFERENCE AREA FOR FORCE AND MOMENT COEFFICIENTS (SREF)
? 10
PITCHING MOMENT COEFFICIENT REFERENCE LENGTH
USUALLY MEAN AERODYNAMIC CHORD LENGTH (CBAR)
? 5
X-COORDINATE OF MOMENT REFERENCE POINT (XBAR)
? 5
Z-COORDINATE OF MOMENT REFERENCE POINT (ZBAR)
? 4
TOTAL WING SPAN IN UNITS OF SREF AND CBAR (USPAN)
? 20.4
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 6
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N

(a) Display of messages necessary in defining the first set of numerical data.

Figure 8. - Completion of configuration definition and flight conditions.

```

THE DATA FOR THE LAST 3 CARDS IS INPUT NEXT,
THESE CARDS ARE NUMBERED 19, 20, AND 21.
ENTER DATA FOR CARD NUMBER 19.
NUMBER OF X-STATIONS TO DEFINE SPATIAL FLOW FIELD
SURVEY GRID < 21, (NXS)
? 2
NUMBER OF Y-STATIONS TO DEFINE THE BUTT LINE
VALUES OF THE SURVEY GRID (NYS)
? 2
NUMBER OF Z-STATIONS TO DEFINE THE WATER LINE
VALUES OF THE SURVEY GRID (NZS)
? 2
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 19
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER THE DATA FOR CARD NUMBER 20
X-STATION VALUES FOR SPATIAL FLOW FIELD (XS)
ENTER X-STATION NUMBER 1
? 1
ENTER X-STATION NUMBER 2
? 2.2
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 20
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
ENTER DATA FOR CARD NUMBER 21
BEGINNING OF GRID IN BUTT LINE DIRECTION (YNOT)
? 3
Y-SPACING OF THE GRID (DELTAY)
? 2
BEGINNING OF GRID IN WATER LINE DIRECTION (ZNOT)
? 3
Z-SPACING OF THE GRID (DELTAZ)
? 2
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 21
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
EXECUTION OF THE PROGRAM IS COMPLETED

```

- (b) Display of messages necessary in defining the last three cards of program VORTAB when the first card is non-zero.

```

THE DATA FOR THE LAST 3 CARDS IS INPUT NEXT,
THESE CARDS ARE NUMBERED 19, 20, AND 21.
ENTER DATA FOR CARD NUMBER 19.
NUMBER OF X-STATIONS TO DEFINE SPATIAL FLOW FIELD
SURVEY GRID < 21, (NXS)
? 0
DO YOU WANT TO RE-ENTER THE DATA FOR CARD 19
ENTER Y OR T FOR YES, OR N OR F FOR NO,
? N
EXECUTION OF THE PROGRAM IS COMPLETED

```

- (c) Display of messages necessary in defining the last three cards of program VORTAB when the first card is zero.

Figure 8. - Concluded.

A SCR CONFIGURATION									
0	0	0	0.000	0.000	.500	.500	0		
1		1.000							
1		1.000							
0		0.000	0.000	0.000	0.000				
11		100.000	2.000	2.000	2.000	38.500			
	22.877	1.797	-1.609	48.672		FLAT PANEL			
	40.657	6.905	-3.710	30.892		FLAT PANEL			
	3.	12.	0.	0.		NVDR,RNCV,SPC,PDL			
	0.0000	0.0000	0	28	0	0	0		
	0.0000	.1250	.2500	.5000	.7500	1.0000	1.5000	2.5000	
	5.0000	10.0000	15.0000	20.0000	25.0000	30.0000	35.0000	40.0000	
	45.0000	50.0000	55.0000	60.0000	65.0000	70.0000	75.0000	80.0000	
	85.0000	90.0000	95.0000	100.0000					
	0.0000	.0070	.0070	.0014	.0014	.0007	-.0024	-.0102	
	-.0481	-.2582	-.5795	-.9842	-1.4437	-1.9066	-2.4100	-2.9100	
	-3.4200	-3.9400	-4.4100	-4.8600	-5.2875	-5.6779	-6.0400	-6.4000	
	-6.7260	-7.0172	-7.2700	-7.4800					
	0.0000	.0064	.0149	.0277	.0426	.0554	.0842	.1407	
	.2644	.3380	.3102	.2132	.0672	-.0789	-.2761	-.4750	
	-.7058	-.9300	-1.1834	-1.4329	-1.6900	-1.9500	-2.2200	-2.4000	
	-2.7400	-3.0112	-3.2660	-3.5200					
	40.657	6.905	-3.710	30.892		FLAT PANEL			
	55.086	11.310	-4.313	17.644		FLAT PANEL			
	3.	12.	0.	0.		NVDR,RNCV,SPC,PDL			
	0.0000	0.0000	0	28	0	0	0		
	0.0000	.1250	.2500	.5000	.7500	1.0000	1.5000	2.5000	
	5.0000	10.0000	15.0000	20.0000	25.0000	30.0000	35.0000	40.0000	
	45.0000	50.0000	55.0000	60.0000	65.0000	70.0000	75.0000	80.0000	
	85.0000	90.0000	95.0000	100.0000					
	0.0000	.0064	.0149	.0277	.0426	.0554	.0842	.1407	
	.2644	.3380	.3102	.2132	.0672	-.0789	-.2761	-.4750	
	-.7058	-.9300	-1.4300	-1.6900	-1.6900	-1.9500	-2.2200	-2.4000	
	-2.7400	-3.0112	-3.2660	-3.5200					
	0.0000	.0056	.0094	.0169	.0245	.0301	.0433	.0678	
	.1299	.2278	.2955	.3135	.2861	.2598	.1958	.1318	
	.0414	-.0508	-.1638	-.2748	-.4009	-.5308	-.6720	-.8150	
	-.9656	-1.1180	-1.2780	-1.4399					

Figure 9. - Numerical definition of a Supersonic Cruise Research (SCR) configuration presented in figure 1.

55.086	11.310	-4.313	17.644	FLAT PANEL			
65.734	15.132	-4.753	10.441	FLAT PANEL			
3.	12.	0.	0.	NVDR,RNCV,SPC,PDL			
0.0000	0.0000	0	28	0	0	0	0
0.0000	.1250	.2500	.5000	.7500	1.0000	1.5000	2.5000
5.0000	10.0000	15.0000	20.0000	25.0000	30.0000	35.0000	40.0000
45.0000	50.0000	55.0000	60.0000	65.0000	70.0000	75.0000	80.0000
85.0000	90.0000	95.0000	100.0000				
0.0000	.0056	.0094	.0169	.0245	.0301	.0433	.0678
.1299	.2278	.2955	.3135	.2861	.2598	.1958	.1318
.0414	-.0508	-.1638	-.2748	-.4009	-.5308	-.6720	-.8150
-.9656	-1.1180	-1.2780	-1.4399				
0.0000	.0032	.0032	.0097	.0130	.0195	.0292	.0584
.1200	.2140	.2821	.2983	.2723	.2464	.1816	.1200
.0324	-.0551	-.1524	-.2497	-.3566	-.4735	-.5836	-.7036
-.8333	-.9565	-1.0926	-1.2191				
65.734	15.132	-4.753	10.441	FLAT PANEL			
75.694	20.901	-5.265	5.373	FLAT PANEL			
3.	12.	0.	0.	NVDR,RNCV,SPC,PDL			
0.0000	0.0000	0	28	0	0	0	0
0.0000	.1250	.2500	.5000	.7500	1.0000	1.5000	2.5000
5.0000	10.0000	15.0000	20.0000	25.0000	30.0000	35.0000	40.0000
45.0000	50.0000	55.0000	60.0000	65.0000	70.0000	75.0000	80.0000
85.0000	90.0000	95.0000	100.0000				
0.0000	.0032	.0032	.0097	.0130	.0195	.0292	.0584
.1200	.2140	.2821	.2983	.2723	.2464	.1816	.1200
.0324	-.0551	-.1524	-.2497	-.3566	-.4735	-.5836	-.7036
-.8333	-.9565	-1.0926	-1.2191				
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

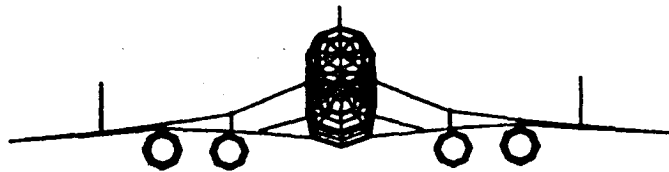
Figure 9. - Continued.

92.362	.785	-3.816	.553						FLAT PANEL
83.746	1.561	-3.816	9.890						FLAT PANEL
3.	3.	0.	0.						NVOR,RNCV,SPC,PDL
0.0000	0.0000	0	0	0					0 0
83.746	1.561	-3.816	9.890						FLAT PANEL
88.781	5.148	-4.782	2.808						FLAT PANEL
3.	3.	0.	0.						NVOR,RNCV,SPC,PDL
0.0000	0.0000	0	0	0					0 0
0.000	0.000	-2.224	100.164						FUSELAGE PANEL
0.000	0.000	1.621	100.164						FUSELAGE PANEL
4.000	30.000	0.000	999.000						NVOR,RNCV,SPC,PDL
-90.0000	1.9226	-36.1427	2.2308	5.9048	2.1281	47.9524	2.0254		
90.0000	1.9226								
0.00	0.00-1	16	0	0	1				
0.0000	7.3226	15.0690	19.8244	23.0545	28.3520	39.5570	50.7615		
58.8015	66.5397	74.7057	83.0563	89.1507	93.9653	98.2314	100.0000		
.3012	.2923	.3104	.1429	-.0102	-.4874	-1.5995	-2.6515		
-3.2159	-3.6549	-3.5805	-3.2348	-2.8664	-2.6074	-2.2215	-1.9638		
0.0000	22.6826	60.4650	87.7029	100.0303	93.7800	103.1695	100.0000		
100.0000	098.8914	96.7904	68.1737	36.4113	19.7591	4.9398	2.0371		
84.291	0.000	-2.026	14.652						VERTICAL PANEL
96.243	0.000	2.927	3.541						VERTICAL PANEL
4.	3.	0.	0.						NVOR,RNCV,SPC,PDL
0.00	0.00	0	0	0					0 0
66.132	15.132	-4.905	11.294						VERTICAL PANEL
76.786	15.132	-1.649	1.587						VERTICAL PANEL
3.	3.	0.	0.						NVOR,RNCV,SPC,PDL
0.00	0.00	0	0	0					0 0

Figure 9. - Continued.

63.260	7.082	-7.182	11.296		NACELLE PANEL		
63.260	7.082	-7.182	11.296		NACELLE PANEL		
8.	7.	0.	999.		NVOR,RNCV,SPC,PDL		
-90.0000	1.1157	-45.0000	1.1157	0.0000	1.1157	45.0000	1.1157
90.0000	1.1157	135.0000	1.1157	180.0000	1.1157	225.0000	1.1157
270.0000	1.1157						
0.00	0.00	0	3	0	0	1	
0.0000	72.9797	100.0000					
0.0000	0.0000	0.0000					
63.0560	100.0000	95.0525					
64.458	11.284	-7.100	11.174		NACELLE PANEL		
64.458	11.284	-7.100	11.174		NACELLE PANEL		
8.	7.	0.	999.		NVOR,RNCV,SPC,PDL		
-90.0000	1.1760	-45.0000	1.1760	0.0000	1.1760	45.0000	1.1760
90.0000	1.1760	135.0000	1.1760	180.0000	1.1760	225.0000	1.1760
270.0000	1.1760						
0.00	0.00	0	3	0	0	1	
0.0000	73.7821	100.0000					
0.0000	0.0000	0.0000					
56.6572	100.0000	85.6126					
0	0	0					

Figure 9. - Concluded.



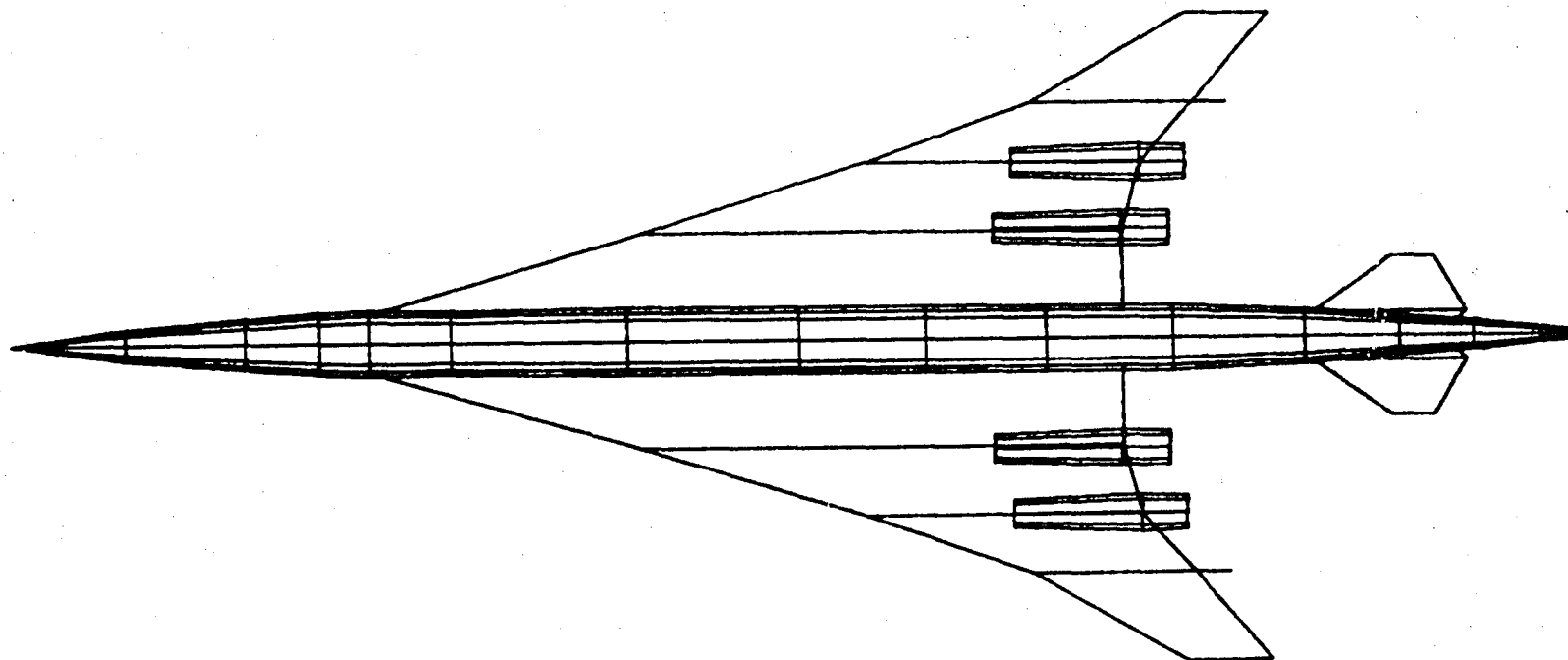
(a) Front view.

Figure 10. - A VORTAB representation of a SCR configuration.



(b) Side view.

Figure 10. - Continued.

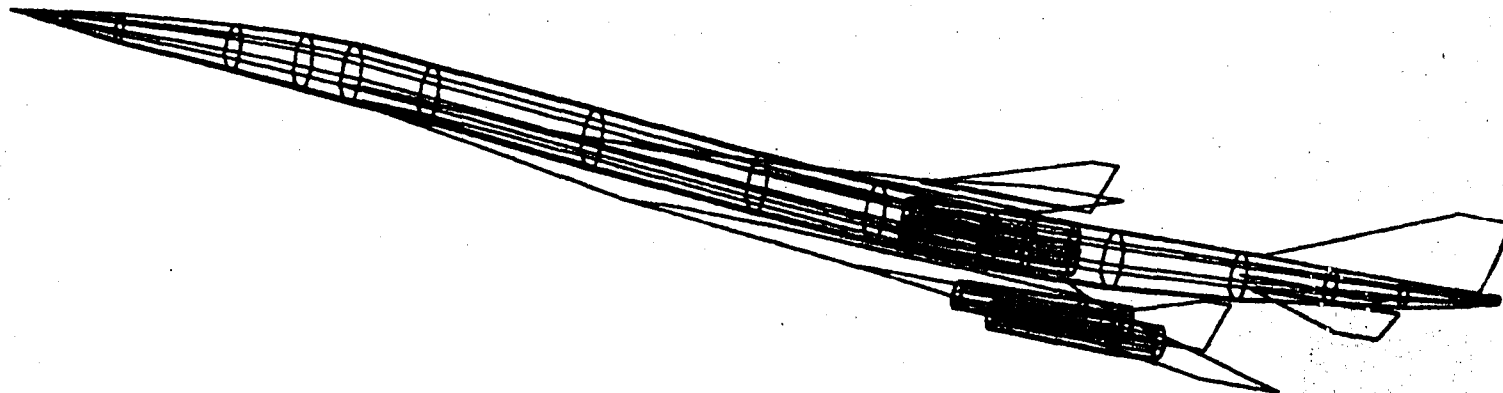


(c) Plan view.

Figure 10. - Continued.

A SCR CONFIGURATION
THE ROLL ANGLE IS 14.0
THE PITCH ANGLE IS 14.0
THE YAW ANGLE IS 14.0

FOR ENLARGEMENT INPUT YES
?



(d) Oblique view with rotation in roll, pitch, and yaw.

Figure 10. - Concluded.

APPENDIX A
PROCEDURE FILE PVORTAB

```
GET, PLANE/ST=CPF/UN=214737C.  
RETURN, TAPE3, TAPE4, NAME.  
PLANE.  
REPLACE, TAPE7=NAME.  
APPEND, NAME, TAPE3, TAPE4)  
GET, NAME.  
PACK, NAME.  
REPLACE, NAME.  
CLEAR.  
GET, TAPE1=NAME.  
GET, READB, PLOTB/ST=CPF/UN=214737C.  
READB.  
PLOTB.  
EXIT.  
/
```


APPENDIX B

SOURCE LISTING OF PROGRAM VORTAB

PROGRAM VORTAB(INPUT,OUTPUT,TAPE1=INPUT,TAPE2,TAPE3,TAPE4,TAPE7)	VORTAB	1
C ** MAIN PROGRAM, CALLS SUBROUTINES THAT GENERATE PANELS.	VORTAB	2
REAL MLINE,MSIDE	VORTAB	3
COMMON /FUSS/XO,YO,FSCORD,FSLOPE,BFUS,NPANS,FSCALE	VORTAB	4
COMMON /FRG/MLINE,BLINE,XXO,YYO	VORTAB	5
COMMON /SIDE/MSIDE,BSIDE,XX,ZZ	VORTAB	6
COMMON /ZXPR/ ZC(2,150),XAF(150),PHT(9),RQ(9)	VORTAB	7
DATA NPANS,YLOC/0,0.0/	VORTAB	8
C ** INITIALIZING ROUTINES ARE CALLED.	VORTAB	9
CALL INITT(120)	VORTAB	10
CALL TABINT(1,0,0)	VORTAB	11
CALL TERM(3,4096)	VORTAB	12
CALL CHRISZ(4)	VORTAB	13
CALL FUSPRMS	VORTAB	14
CALL ANMODE	VORTAB	15
PRINT *, "THREE POINTS FROM THE FRONT VIEW ARE ENTERED NEXT."	VORTAB	16
PRINT *, "FIRST POINT AND SECOND POINT REFER TO 2 POINTS ON"	VORTAB	17
PRINT *, "A LINE PARALLEL TO THE Y-AXIS."	VORTAB	18
PRINT *, " "	VORTAB	19
PRINT *, "FIRST POINT"	VORTAB	20
CALL FNDPLAC(MLINE,BLINE,XXO,YYO)	VORTAB	21
CALL NEWLIN2	VORTAB	22
CALL ANMODE	VORTAB	23
PRINT *, "THREE POINTS FROM THE SIDE VIEW ARE ENTERED NEXT"	VORTAB	24
PRINT *, "FIRST POINT AND SECOND POINT REFER TO TWO POINTS ON"	VORTAB	25
PRINT *, "A LINE PARALLEL TO THE X-AXIS."	VORTAB	26
PRINT *, " "	VORTAB	27
PRINT *, "FIRST POINT"	VORTAB	28
CALL FNDPLAC(MSIDE,BSIDE,XX,ZZ)	VORTAB	29
C ** ROUTINES FOR ENTERING VARIOUS PANELS ARE CALLED.	VORTAB	30
1 CALL HTAIL(YLOC)	VORTAB	31
CALL NEWPAG	VORTAB	32
CALL ANMODE	VORTAB	33

APPENDIX B. - Continued

```
PRINT *,"DO YOU WANT A FUSELAGE"
```

```
CALL YESNOF(ISLT)
```

```
PRINT *," "
```

```
IF(ISLT.LT.0)GO TO 2
```

```
CALL FUSLAGE(YLOC)
```

```
IF(YLOC.EQ.0.0)GO TO 2
```

```
GO TO 1
```

```
2 CALL VTAIL
```

```
CALL NACELLE
```

```
CALL NEWPAG
```

```
CALL ANMODE
```

```
CALL FIRST6(NPANS)
```

```
CALL NEWPAG
```

```
CALL ANMODE
```

```
CALL LAST3
```

```
CALL SYSTEM(0," ")
```

```
CALL NEWPAG
```

```
CALL ANMODE
```

```
CALL FINITT(0,3000)
```

```
STOP
```

```
END
```

C.

```
SUBROUTINE NEWLIN2
```

```
C ** ADVANCES PRINTER TWO LINES.
```

```
CALL NEWLIN
```

```
CALL LINEF
```

```
RETURN
```

```
END
```

C

```
SUBROUTINE RONEPNT(RJ,RK)
```

```
C ** GETS A PAIR OF REAL COORDINATES FROM THE GRAPHICS TABLET.
```

```
VORTAB 34
```

```
VORTAB 35
```

```
VORTAB 36
```

```
VORTAB 37
```

```
VORTAB 38
```

```
VORTAB 39
```

```
VORTAB 40
```

```
VORTAB 41
```

```
VORTAB 42
```

```
VORTAB 43
```

```
VORTAB 44
```

```
VORTAB 45
```

```
VORTAB 46
```

```
VORTAB 47
```

```
VORTAB 48
```

```
VORTAB 49
```

```
VORTAB 50
```

```
VORTAB 51
```

```
VORTAB 52
```

```
VORTAB 53
```

```
VORTAB 54
```

```
VORTAB 55
```

```
VORTAB 56
```

```
VORTAB 57
```

```
VORTAB 58
```

```
VORTAB 59
```

```
VORTAB 60
```

```
VORTAB 61
```

```
VORTAB 62
```

```
VORTAB 63
```

```
VORTAB 64
```

APPENDIX B. - Continued

```

COMMON /TABLET/ KTBMAX,KTBSND,KTRSF
DIMENSION IOUT(3)
DATA IOUT(1),IOUT(2)/27,33/
IOUT(3)=32+KTBMAX+KTBSND+KTBSEE
1 CALL TOUTST(3,IOUT)
CALL GETPNT(I,J,K)
IF(I.GT.31)GO TO 1
IOUT(3)=60
CALL TOUTST(3,IOUT)
RJ=FLOAT(J)
RK=FLOAT(K)
RETURN
END

```

C

VORTAB	65
VORTAB	66
VORTAB	67
VORTAB	68
VORTAB	69
VORTAB	70
VORTAB	71
VORTAB	72
VORTAB	73
VORTAB	74
VORTAB	75
VORTAB	76
VORTAB	77
VORTAB	78

```

SUBROUTINE FRNTLOC(Z1,ARRAY,ISIZ)
C ** GETS A POINT AND LOCATES IT WITH RESPECT TO THE
C ** FRONT VIEW.
REAL MLINE
COMMON /FRO/MLINE,BLINE,XXO,YYO
DIMENSION ARRAY(ISIZ)
DIMENSION AO(3)
DATA AO/10H(FROM THE ,10HFRONT VIEW,3H) /
CALL NEWLIN2
CALL ADUTST(ISIZ,ARRAY)
CALL ADUTST(23,AO)
CALL RONEPNT(X,Y)
IF(ABS(MLINE).LT..001)GO TO 5
B=Y+X/MLINE
XLINE=(B-BLINE)/(MLINE+1.0/MLINE)
YLINE=MLINE*XLINE+BLINE
Z1=SQRT((XLINE-X)**2+(YLINE-Y)**2)
IF(Y.LT.YLINE)Z1=-Z1
RETURN

```

VORTAB	79
VORTAB	80
VORTAB	81
VORTAB	82
VORTAB	83
VORTAB	84
VORTAB	85
VORTAB	86
VORTAB	87
VORTAB	88
VORTAB	89
VORTAB	90
VORTAB	91
VORTAB	92
VORTAB	93
VORTAB	94
VORTAB	95
VORTAB	96
VORTAB	97

APPENDIX B. - Continued

42

```

5 Z1=Y-YYO
  RETURN
  END

```

```

VORTAB      98
VORTAB      99
VORTAB     100
VORTAB     101

```

C

SUBROUTINE LOCATE(X,Y)

C ** LOCATES POINTS WITH RESPECT TO FUSELAGE CENTER LINE,
C ** FROM THE TOP VIEW.

```

COMMON /FUSS/XO,YO,FSCORD,FSLOPE,BFUS,NPANS,FSCALE
SIGN=1.0
IF(ABS(FSLOPE).LT..001)GO TO 5
B2=Y+X/FSLOPE
XLINE=(B2-BFUS)/(FSLOPE+1.0/FSLOPE)
YLINE=FSLOPE*XLINE+BFUS
IF(Y.LT.YLINE)SIGN=-SIGN
Y=SQRT((XLINE-X)**2+(YLINE-Y)**2)*SIGN
X=SQRT((YLINE-YO)**2+(XLINE-XO)**2)
RETURN
5 X=X-XO
  Y=Y-YO
  RETURN
  END

```

```

VORTAB     102
VORTAB     103
VORTAB     104
VORTAB     105
VORTAB     106
VORTAB     107
VORTAB     108
VORTAB     109
VORTAB     110
VORTAB     111
VORTAB     112
VORTAB     113
VORTAB     114
VORTAB     115
VORTAB     116
VORTAB     117
VORTAB     118
VORTAB     119

```

C

SUBROUTINE LOCATES(X,Z)

C ** LOCATES POINTS WITH RESPECT TO THE SIDE VIEW.

```

REAL MSIDE
COMMON/SIDE/MSIDE,BSIDE,XX,ZZ
IF(ABS(MSIDE).LT..001)GO TO 2
SIGN=1.0
B2=Z+X/MSIDE
XLINE=(B2-BSIDE)/(MSIDE+1.0/MSIDE)
ZLINE=MSIDE*XLINE+BSIDE

```

```

VORTAB     120
VORTAB     121
VORTAB     122
VORTAB     123
VORTAB     124
VORTAB     125
VORTAB     126
VORTAB     127
VORTAB     128

```

APPENDIX B. - Continued

	IF(Z.LT.ZLINE)SIGN=-1.0	VORTAB	129
	Z=SQRT((XLINE-X)**2+(ZLINE-Z)**2)*STGN	VORTAB	130
	X=SQRT((ZLINE-ZZ)**2+(XLINE-XX)**2)	VORTAB	131
	RETURN	VORTAB	132
2	X=X-XX	VORTAB	133
	Z=Z-ZZ	VORTAB	134
	RETURN	VORTAB	135
	END	VORTAB	136
C		VORTAB	137
	SUBROUTINE RESCALE(X,Y,Z,CD,X1,Y1,Z1,CD1,PDL,NVOR)	VORTAB	138
C **	RE-SCALES THE DATA FROM SCREEN UNITS TO USER UNITS.	VORTAB	139
	COMMON /FUSS/XO,YO,FSCORD,FSLUPF,BFUS,NPANS,FSCALE	VORTAB	140
	COMMON /ZXPR/ ZC(2,150),XAF(150),PHI(9),RO(9)	VORTAB	141
	X=X*FSCALE	VORTAB	142
	Y=ABS(Y*FSCALE)	VORTAB	143
	Z=Z*FSCALE	VORTAB	144
	CD=CD*FSCALE	VORTAB	145
	X1=X1*FSCALE	VORTAB	146
	Y1=ABS(Y1*FSCALE)	VORTAB	147
	Z1=Z1*FSCALE	VORTAB	148
	CD1=CD1*FSCALE	VORTAB	149
	IF(PDL.EQ.0.0)RETURN	VORTAB	150
	DO 10 J=1,NVOR	VORTAB	151
10	RO(J)=RO(J)*FSCALE	VORTAB	152
	RETURN	VORTAB	153
	END	VORTAB	154
C		VORTAB	155
	SUBROUTINE LINFEED(N)	VORTAB	156
C **	ADVANCES PRINTER N LINES.	VORTAB	157
	IF(N.EQ.0)RETURN	VORTAB	158
	CALL CARTN	VORTAB	159

APPENDIX B. - Continued

```

      DO 1 J=1,N
1     CALL LINEF
      RETURN
      END

```

```

VORTAB      160
VORTAB      161
VORTAB      162
VORTAB      163
VORTAB      164

```

C

```

      SUBROUTINE FNDPLAC(MLINE,BLINE,X,Y)
C ** DETERMINES SLOPE OF REFERENCE LINE AND LOCATES
C ** NOSE POINT FOR THE FRONT AND SIDE VIEWS.
      REAL MLINE
      DIMENSION A1(2),A2(2)
      DATA A1/10HSECOND POI,10HNT /
      DATA A2/10HCENTER LEA,10HDING POINT/
      CALL SYSTEM
      CALL LINFEED(4)
      CALL RONEPNT(X1,Y1)
      CALL NEWLIN2
      CALL ADUTST(20,A1)
      CALL RONEPNT(X2,Y2)
      MLINE=(Y2-Y1)/(X2-X1)
      CALL NEWLIN2
      CALL ADUTST(20,A2)
      CALL RONEPNT(X,Y)
      BLINE=Y-MLINE*X
      RETURN
      END

```

```

VORTAB      165
VORTAB      166
VORTAB      167
VORTAB      168
VORTAB      169
VORTAB      170
VORTAB      171
VORTAB      172
VORTAB      173
VORTAB      174
VORTAB      175
VORTAB      176
VORTAB      177
VORTAB      178
VORTAB      179
VORTAB      180
VORTAB      181
VORTAB      182
VORTAB      183
VORTAB      184
VORTAB      185

```

C

```

      SUBROUTINE FUSPRMS
C ** GETS FUSELAGE LENGTH AND SLOPE TO BE USED LATER,
C ** AND NOSE POINT FROM THE TOP VIEW.
      COMMON /FUSS/X0,Y0,FSCORD,FSLOPE,RFUS,NPANS,FSCALE
      DIMENSION NOSEPNT(2),TAILPNT(3),TOPVIEW(2)

```

```

VORTAB      186
VORTAB      187
VORTAB      188
VORTAB      189
VORTAB      190

```

APPENDIX B. - Continued

```

DATA NOSEPNT/10HCENTER LEA,10HONG POINT/
DATA TAILPNT/10HCENTER TRA,10HILING POIN,1HT/
DATA TOPVIEW/10HFROM THE T,7HOP VIEW/
C ** NOSE POINT.
  CALL NEWPAG
  CALL ADUTST(17,TOPVIEW)
  CALL NEWLIN
  CALL ADUTST(20,NOSEPNT)
  CALL RONEPNT(XO,YO)
C ** TAIL POINT.
  CALL NEWLIN2
  CALL ADUTST(21,TAILPNT)
  CALL RONEPNT(X,Y)
  FSLOPE=(Y-YO)/(X-XO)
  BFUS=Y-FSLOPE*X
C ** CALCULATES THE LENGTH OF THE FUSELAGE IN RASTER UNITS.
  FSCORD=SQRT((X-XO)**2+(Y-YO)**2)
  IF(X.LT.10000.)GO TO 5
  X=1.0
  5 PRINT *, " "
  PRINT *, " "
  PRINT *, "INPUT THE LENGTH OF THE FUSELAGE (A NUMBER). "
  10 READ (1,*)RLENGTH
  IF(EOF(1))10,11
  11 IF(RLENGTH.GT.-10.)GO TO 6
  STOP 7
C ** CALCULATES SCALE FACTOR TO CONVERT FROM RASTER
C ** TO USER UNITS.
  6 FSCALE=RLENGTH/FSCORD
  CALL NEWLIN2
  CALL NEWLIN2
  RETURN
  END
C

```

VORTAB	191
VORTAB	192
VORTAB	193
VORTAB	194
VORTAB	195
VORTAB	196
VORTAB	197
VORTAB	198
VORTAB	199
VORTAB	200
VORTAB	201
VORTAB	202
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VORTAB	212
VORTAB	213
VORTAB	214
VORTAB	215
VORTAB	216
VORTAB	217
VORTAB	218
VORTAB	219
VORTAB	220
VORTAB	221
VORTAB	222
VORTAB	223
VORTAB	224

APPENDIX B. - Continued

```

SUBROUTINE HTAIL(YLOC)
C ** THIS INPUTS NON-VERTICAL FLAT PANELS.
COMMON /FUSS/XO,YO,FSCORD,FSLOPE,BFUJ,NPANS,FSCALE
COMMON /WING/ WX(3),WY(3),WZ(3),MODE
COMMON /ZXPR/ ZC(2,150),XAF(150),PHI(9),RD(9)
DIMENSION IANS(15),AO(2),A1(2),A2(2),A1B(2)
DIMENSION FTP(3),TOP(2)
REAL NVOR
LOGICAL FIRST
DATA PIE,ITS,IQUANT,ISYNT,NPP,PDL/3.1415926,4*0,0.0/
DATA FIRST,IANSER,ISLT2,NO2/.TRUE.,72,1,-1/
DATA AO/10HROOT LEADI,10HNG POINT /
DATA TOP/1CH(FROM THE ,1OHTOP VIEW) /
DATA A1/10HROOT TRAIL,10HING POINT /
DATA A1B/10HTIP TRAILI,9HNG POINT /
DATA A2/10HOUTER LEAD,10HING POINT /
DATA FTP/10HENTER WING,10H/CANARD FD,10HGE POINT /
DATA IPANEL/1/
C ** SOME PARAMETERS ARE INITIALIZED.
85 IPAN3=1
   IPAN4=-1
   IPAN2=1
   CALL NEWPAG
   CALL ANMODE
3  CALL NEWLIN2
C ** DETERMINES IF FLAT PANELS ARE DESIRED.
   IF(IPANEL.EQ.1)GO TO 1
   IF(YLOC.EQ.0.0)GO TO 1
8  PRINT *,"DO YOU WANT THIS FLAT PANEL ATTACHED"
   CALL YESNOF(IPAN3)
   IF(NO2.LT.0)CALL LINFEED(3)
   IPAN4=1
   IF(IAPN3)9,9,11
1  PRINT *,"ARE FLAT PANELS DESIRED"
   CALL YESNOF(MODE)

```

```

VORTAB      225
VORTAB      226
VORTAB      227
VORTAB      228
VORTAB      229
VORTAB      230
VORTAB      231
VORTAB      232
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VORTAB      252
VORTAB      253
VORTAB      254
VORTAB      255
VORTAB      256
VORTAB      257
VORTAB      258
VORTAB      259

```


APPENDIX B. - Continued

```

        IF(MODE.LT.0)RETURN
    5 CALL NEWLIN2
C ** DETERMINES IF WING AND FUSELAGE ARE TO BE CONNECTED.
    PRINT *,"THE FIRST PANEL IS A WING ATTACHED TO THE FUSLAGE."
    CALL SYSTEM(0," ")
    10 IF(IPAN4)9,9,8
    9 ITESTW=0
    NAP=0
    IANSR2=IANSE
    11 CALL NEWLIN2
C ** GETS ROOT LEADING POINT.
    CALL ADUTST(19,A0)
    CALL ADUTST(19,TP)
    CALL RONEPNT(X1,Y1)
    CALL LOCATE(X1,Y1)
    Y1=ABS(Y1)
    IF(Y1.LT.3.0)Y1=0.0
    CALL NEWLIN2
C ** GETS ROOT TRAILING POINT.
    CALL ADUTST(20,A1)
    CALL ADUTST(19,TP)
    CALL RONEPNT(X2,Y2)
    CALL LOCATE(X2,Y2)
    Y2=ABS(Y2)
    CORD1=SQRT((X1-X2)**2+(Y1-Y2)**2)
C ** GETS VERTICAL LOCATION OF ROOT CHORD.
    CALL FRNTLOC(Z1,FTP,29)
    IF(YLOC.EQ.0.0)GO TO 12
    IF(IPAN3.LT.0)GO TO 12
    Y1=WY(3)
    Z1=WZ(3)
    12 CALL NEWLIN2
    IANSR2=IANSE
C ** GETS LEADING POINT FROM PANEL TIP.
    CALL ADUTST(20,A2)

```

VORTAB	260
VORTAB	261
VORTAB	262
VORTAB	263
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VORTAB	267
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VORTAB	285
VORTAB	286
VORTAB	287
VORTAB	288
VORTAB	289
VORTAB	290
VORTAB	291
VORTAB	292
VORTAB	293
VORTAB	294

APPENDIX B. - Continued

CALL ADUTST(19,TOP)	VORTAB	295
CALL RONEPNT(X3,Y3)	VORTAB	296
CALL LOCATE(X3,Y3)	VORTAB	297
Y3=ABS(Y3)	VORTAB	298
IF(Y3.LT.3.0)Y3=0.0	VORTAB	299
CALL NEWLIN2	VORTAB	300
C ** GET TRAILING POINT FROM PANEL TIP.	VORTAB	301
CALL ADUTST(19,A1B)	VORTAB	302
CALL ADUTST(19,TOP)	VORTAB	303
CALL RONEPNT(X4,Y4)	VORTAB	304
CALL LOCATE(X4,Y4)	VORTAB	305
Y4=ABS(Y4)	VORTAB	306
CORD2=SQRT((X3-X4)**2+(Y3-Y4)**2)	VORTAB	307
C ** GETS VERTICAL LOCATION OF PANEL TIP.	VORTAB	308
CALL FRNTLOC(Z2,FTP,29)	VORTAB	309
CALL NEWLIN2	VORTAB	310
CALL ANMODE	VORTAB	311
C ** VARIOUS PARAMETERS ARE TO BE INPUT BY THE USER.	VORTAB	312
PRINT *,"NUMBER OF SPANWISE VORTICES (NVOR)"	VORTAB	313
1000 READ (1,*)NVOR	VORTAB	314
IF(EOF(1))1000,1001	VORTAB	315
1001 PRINT *,"NUMBER OF STREAMWISE VORTICES (RNCV)"	VORTAB	316
1002 READ (1,*)RNCV	VORTAB	317
IF(EOF(1))1002,987	VORTAB	318
987 PRINT *,"LEADING EDGE SUCTION MULTIPLIER (SPC) 0.0<=SPC<=1.0, OR"	VORTAB	319
PRINT *,"SPC<0.0 FOR POLHAMUS ANALOGY"	VORTAB	320
1003 READ (1,*)SPC	VORTAB	321
IF(EOF(1))1003,1004	VORTAB	322
1004 IF(SPC.GT.1.0)GO TO 987	VORTAB	323
IF(IANSR2.EQ.87)GO TO 6	VORTAB	324
PRINT *,"ENTER THE ANGLE OF THE ROOT CHORD LINE (IN DEG.)"	VORTAB	325
PRINT *,"A POSITIVE ANGLE CAUSES A DEFLECTION DOWN."	VORTAB	326
1005 READ (1,*)AINC1	VORTAB	327
IF(EOF(1))1005,1006	VORTAB	328
1006 AINC1=TAN(-AINC1/180.*PIE)	VORTAB	329

APPENDIX B. - Continued

```

6 PRINT *, "ENTER THE ANGLE OF THE TIP CHORD LINE (IN DEG.)"
1007 READ (1,*)AINC2
      IF(EOF(1))1007,1008
1008 AINC2=TAN(-AINC2/180.*PIE)
      IF(ITESTW.EQ.-1)GO TO 78
C ** WING CAMBER CAN BE ADDED.
      IF(NAP.EQ.0)GO TO 7
      PRINT *, " "
      PRINT *, " "
      PRINT *, " "
      7 CALL WNGCAMB(NAP,ITESTW,CAMBI,CAMBO)
        Z1=Z1-CORD1*CAMBI
        Z2=Z2-CORD2*CAMBO
78 IF(IPAN2.EQ.2)GO TC 20
      IPAN2=2
      WX(1)=X1
      WY(1)=ABS(Y1)
      WZ(1)=Z1
20 CONTINUE
      CALL NEWPAG
C ** THE PANEL CAN BE ABORTED.
      PRINT *, "DO YOU WANT THE PREVIOUS PANEL."
      CALL YESNOF(NO2)
      IF(NO2.LT.0)NAP=0
      IF(NO2)87,21,21
C ** VARIABLES TO SAVE DATA FOR ERROR RECOVERY.
21 AX=X1
      AY=Y1
      AZ=Z1
      ANG1=AINC2
      ACD=CORD1
      AX2=SAFEX1=X3
      AY2=SAFEY1=Y3
      AZ2=SAFEZ1=Z2
      ACD2=SAFCRD1=CORD2

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VORTAB	330
VORTAB	331
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VORTAB	362
VORTAB	363
VORTAB	364

APPENDIX B. - Continued

```

      ISAFEW=ITESTW
      SAFENAP=NAP
      CALL RESCALE(AX,AY,AZ,ACD,AX2,AY2,AZ2,ACD2,0.0,1)
C ** WRITES THE PANEL DATA ON A DISC FILE.
      WRITE(3,100)AX,AY,AZ,ACD
      WRITE(3,100)AX2,AY2,AZ2,ACD2
      WRITE(3,101)NVOR,RNCV,SPC,PDL
      WRITE(3,103)AINC1,AINC2,ITS,NAP,TQUANT,TSYNT,NPP
      NPANS=NPANS+1
      IPANEL=IPANEL+1
      IPAN4=-1
      IPAN3=-1
      IF(NAP.LE.2)GO TO 919
      WRITE(3,102)(XAF(J),J=1,NAP)
      WRITE(3,102)(ZC(1,J),J=1,NAP)
      WRITE(3,102)(ZC(2,J),J=1,NAP)
      DO 30 JJ=1,NAP
      JJ2=JJ+100
      XAF(JJ2)=XAF(JJ)
30   ZC(2,JJ2)=ZC(2,JJ)
919  CONTINUE
100  FORMAT(4F10.3,10X,"FLAT PANEL")
101  FORMAT(4F10.3,10X,"NVOR,RNCV,SPC,PDL")
102  FORMAT(8F10.4)
103  FORMAT(2F10.4,I2,8X,I2,3(9X,I1))
      GO TO 86
87   IF(ISLT2)86,85,85
86   ISLT2=-1
C ** ALLOWS THE USER TO CHOOSE WHAT TYPE OF FLAT
C ** PANEL IS DESIRED IF ANY.
      CALL NEWPAG
      CALL ANMODE
      NLINE=2
      IF(.NOT.FIRST)GO TO 2
      PRINT *, "ONE OF THREE POSSIBILITIES MUST BE CHOSEN NEXT,"

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VORTAB	365
VORTAB	366
VORTAB	367
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VORTAB	392
VORTAB	393
VORTAB	394
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VORTAB	397
VORTAB	398
VORTAB	399

APPENDIX B. - Continued

PRINT *, "(1) A PANEL CAN BE ADDED TO THE OUTER EDGE OF THE"	VORTAB	400
PRINT *, " PREVIOUS ONE (I.E. A MULTY-PANELED WING),"	VORTAB	401
PRINT *, "(2) AN ENTIRELY NEW FLAT PANEL CAN BE ENTERED,"	VORTAB	402
PRINT *, "(3) THE NEXT TYPE OF PANEL CAN RE ENTERED."	VORTAB	403
PRINT *, " "	VORTAB	404
2 IF(FIRST)NLINE=8	VORTAB	405
FIRST=.FALSE.	VORTAB	406
PRINT *, "FOR AN EXTENDING FLAT PANEL INPUT...E (EXTENDING)."	VORTAB	407
PRINT *, "FOR A NEW FLAT PANEL INPUT.....N (NEW PANEL)."	VORTAB	408
PRINT *, "TO STOP FLAT PANELS INPUT.....O (QUIT)."	VORTAB	409
222 READ(1,104) IANS	VORTAB	410
IF(EOF(1))222,223	VORTAB	411
223 CALL LINFEED(NLINE)	VORTAB	412
IANSER=IANS(1)	VORTAB	413
IF(IANSER.EQ.1HN)GO TO 10	VORTAB	414
IF(IANSER.EQ.1HQ)GO TO 81	VORTAB	415
IF(IANSER.EQ.1HE)GO TO 335	VORTAB	416
PRINT *, "RE-ENTER YOUR ANSWER LEFT JUSTIFIED"	VORTAB	417
NLINE=2	VORTAB	418
GO TO 222	VORTAB	419
C ** MAKES IT POSSIBLE TO HAVE JOINED WING PANELS AND	VORTAB	420
C ** RECOVER FROM ERRONECUS INPUT.	VORTAB	421
335 X1=SAFEX1	VORTAB	422
Y1=SAFEY1	VORTAB	423
Z1=SAFEZ1	VORTAB	424
AINC1=ANG1	VORTAB	425
CORD1=SAFCRD1	VORTAB	426
ITESTW=ISAFEW	VORTAB	427
NAP=SAFENAP	VORTAB	428
IF(NQ2.GT.0)GO TO 12	VORTAB	429
DO 31 JJ=1,NAP	VORTAB	430
JJ2=JJ+100	VORTAB	431
XAF(JJ)=XAF(JJ2)	VORTAB	432
31 ZC(2,JJ)=ZC(2,JJ2)	VORTAB	433
GO TO 12	VORTAB	434

APPENDIX B. - Continued

81	WX(2)=SAFEX1	VORTAB	435
	WY(2)=ABS(SAFEY1)	VORTAB	436
	WZ(2)=SAFEZ1	VORTAB	437
	RETURN	VORTAB	438
104	FORMAT(15A1)	VORTAB	439
	END	VORTAB	440
C		VORTAB	441
	SUBROUTINE WNGCAMB(NAP,ISLT,CAMBI,CAMBO)	VORTAB	442
C **	ALLWS WINGS TO HAVE CAMBER.	VORTAB	443
	COMMON /ZXPR/ ZC(2,150),XAF(150),PHT(9),RD(9)	VORTAB	444
	DIMENSION IANS(15)	VORTAB	445
	IF(NAP.GT.0)GO TO 10	VORTAB	446
	CALL NEWPAG	VORTAB	447
	CALL ANMODE	VORTAB	448
C **	ASKS IF CAMBER IS DESIRED.	VORTAB	449
	PRINT *,"DO YOU WANT CAMBER IN THE PANELS"	VORTAB	450
	CALL YESNOF(ISLT)	VORTAB	451
	IF(ISLT.GT.0)GO TO 40	VORTAB	452
	CAMBI=0.0	VORTAB	453
	CAMBO=0.0	VORTAB	454
	RETURN	VORTAB	455
C **	DETERMINES METHOD OF REPRESENTING CAMBER.	VORTAB	456
40	PRINT *,"CAMBER IS ENTERED IN %-CHORD OR LINEAR MEASURE."	VORTAB	457
	PRINT *,"DO YOU WANT CAMBER IN %-CHORD"	VORTAB	458
	CALL YESNOF(ICMB)	VORTAB	459
	IF(ICMB.GT.0)GO TO 12	VORTAB	460
	CALL WNGCMB2(NAP,CAMBI,CAMBO)	VORTAB	461
	RETURN	VORTAB	462
12	PRINT *,"INPUT CAMBER DATA BELOW."	VORTAB	463
C **	ENTERS PANEL CAMBER IN %-CHORD.	VORTAB	464
	PRINT *,"INPUT PERCENT CHORD < 0.0 TO STOP"	VORTAB	465
30	NAP=NAP+1	VORTAB	466
C **	ENTERS DATA FOR ROOT AND TIP OF PANEL.	VORTAB	467

APPENDIX B. - Continued

```

      PRINT *, "% CHORD,      ROOT CAMBER,      & TIP CAMBER"
1009 READ (1,*)XAF(NAP),ZC(1,NAP),ZC(2,NAP)
      IF(EOF(1))1009,1010
1010 IF(XAF(NAP).LT.0.0)GO TO 35
      GO TO 30
      35 NAP=NAP-1
C ** CALCULATES PARAMETERS TO RELOCATE ROOT OF
C ** PANEL IN VERTICAL DIRECTION.
      CAMBI=ZC(1,1)
      DO 20 JJ=1,NAP
20 IF(ZC(1,JJ).GT.CAMBI)CAMBI=ZC(1,JJ)
      CAMBI=CAMBI*.01
      GO TO 33
C ** GETS CAMBER DATA IN LINEAR MEASURE.
10 IF(ICMB.GT.0)GO TO 11
      CALL WNGCMB2(NAP,CAMBI,CAMBO)
      RETURN
C ** GETS DATA FOR PANEL TIP ONLY.
11 PRINT *,"PERCENT CHORD AND ROOT CAMBER WILL BE DISPLAYED,"
      PRINT *,"FOR THE CURRENT PANEL."
      IANS(1)=1000
      DO 150 J=1,NAP
      ZC(1,J)=ZC(2,J)
      WRITE 200,XAF(J),ZC(1,J)
1011 READ (1,*)ZC(2,J)
      IF(EOF(1))1011,150
150 CONTINUE
200 FORMAT("INPUT TIP CAMBER ?      % CHORD=",F8.3,
1"      ROOT CAMBER="F7.3," %")
C ** RELOCATES PANEL TIP IN VERTICAL DIRECTION.
      CAMBI=0.0
33 CAMBO=ZC(2,1)
      DO 21 JJ=1,NAP
21 IF(ZC(2,JJ).GT.CAMBO)CAMBO=ZC(2,JJ)
      CAMBO=CAMBO*.01

```

VORTAB	468
VORTAB	469
VORTAB	470
VORTAB	471
VORTAB	472
VORTAB	473
VORTAB	474
VORTAB	475
VORTAB	476
VORTAB	477
VORTAB	478
VORTAB	479
VORTAB	480
VORTAB	481
VORTAB	482
VORTAB	483
VORTAB	484
VORTAB	485
VORTAB	486
VORTAB	487
VORTAB	488
VORTAB	489
VORTAB	490
VORTAB	491
VORTAB	492
VORTAB	493
VORTAB	494
VORTAB	495
VORTAB	496
VORTAB	497
VORTAB	498
VORTAB	499
VORTAB	500
VORTAB	501
VORTAB	502

APPENDIX B. - Continued

RETURN	VORTAB	503
END	VORTAB	504
	VORTAB	505
SUBROUTINE WNGCMB2(NAP,CAMBI,CAMBD)	VORTAB	506
C ** ALLOWS WINGS TO HAVE CAMBER, INPUT IN LINEAR DIMENSIONS.	VORTAB	507
COMMON /ZXPR/ ZC(2,150),XAF(150),PHT(9),RO(9)	VORTAB	508
ITEST=-1	VORTAB	509
IF(NAP.EQ.0)GO TO 5	VORTAB	510
ITEST=1	VORTAB	511
GO TO 10	VORTAB	512
C ** GETS PANEL ROOT DATA.	VORTAB	513
5 PRINT *, "INPUT CAMBER DATA BELOW"	VORTAB	514
PRINT *, "TO STOP INPUT DISTANCE FROM LEADING EDGE < 0.0"	VORTAB	515
30 NAP=NAP+1	VORTAB	516
PRINT *, "ENTER DIST. FROM LEAD. EDGE, AND ROOT CAMBER."	VORTAB	517
1012 READ (1,*)XAF(NAP),ZC(1,NAP)	VORTAB	518
IF(EOF(1))1012,1013	VORTAB	519
1013 IF(XAF(NAP).LT.0.0)GO TO 35	VORTAB	520
GO TO 30	VORTAB	521
35 NAP=NAP-1	VORTAB	522
C ** RELOCATES ROOT VERTICALLY.	VORTAB	523
CAMBI=ZC(1,1)	VORTAB	524
DO 11 JJ=2,NAP	VORTAB	525
11 IF(ZC(1,JJ).GT.CAMBI)CAMBI=ZC(1,JJ)	VORTAB	526
CAMBI=CAMBI/XAF(NAP)	VORTAB	527
C ** PUTS ROOT DATA IN %-CHORD.	VORTAB	528
RCORDIN=100./XAF(NAP)	VORTAB	529
DO 12 JJ=1,NAP	VORTAB	530
XAF(JJ)=XAF(JJ)*RCORDIN	VORTAB	531
12 ZC(1,JJ)=ZC(1,JJ)*RCORDIN	VORTAB	532
C ** GETS PANEL TIP DATA.	VORTAB	533
10 DO 15 JJ=1,NAP	VORTAB	534
PRINT *, "STATION NUMBER ",JJ	VORTAB	535

APPENDIX B. - Continued

```

PRINT *,"ENTER DIST. FROM LEAD. EDGE & TIP CAMBER."
1014 READ (1,*)XAF(JJ),ZC(2,JJ)
      IF(EOF(1))1014,15
15 CONTINUE
      IF(ITEST.GT.0)CAMBI=0.0
C ** RELOCATES PANEL TIP VERTICALLY.
      33 CAMBO=ZC(2,1)
C ** PUTS DATA IN %-CHORD.
      DO 16 JK=2,NAP
16 IF(ZC(2,JK).GT.CAMBO)CAMBO=ZC(2,JK)
      CAMBO=CAMBO/XAF(NAP)
      RCORD2N=100./XAF(NAP)
      DO 17 JK=1,NAP
17 ZC(2,JK)=ZC(2,JK)*RCORD2N
      RETURN
      END

```

C

```

      SUBROUTINE YESNOF(WHERE)
C ** ALLOWS A QUESTION TO BE ANSWERED WITH YES OR NO,
C ** OR, TRUE OR FALSE, OR ANYTHING LESS THEN 16 CHARACTERS
C ** THAT STARTS WITH Y,T,N, OR F.
      INTEGER WHERE
      DIMENSION ANSER(15)
      PRINT *,"ENTER Y OR T FOR YES, OR N OR F FOR NO"
4 READ (1,1) ANSER
      IF(EOF(1))5,10
5 CALL LINEF
      GO TO 4
1 FORMAT(15A1)
10 ANS=ANSER(1)
      IF(ANS.EQ.1HT)GO TO 2
      IF(ANS.EQ.1HY)GO TO 2
      IF(ANS.EQ.1HN)GO TO 3

```

```

VORTAB 536
VORTAB 537
VORTAB 538
VORTAB 539
VORTAB 540
VORTAB 541
VORTAB 542
VORTAB 543
VORTAB 544
VORTAB 545
VORTAB 546
VORTAB 547
VORTAB 548
VORTAB 549
VORTAB 550
VORTAB 551
VORTAB 552

```

```

VORTAB 553
VORTAB 554
VORTAB 555
VORTAB 556
VORTAB 557
VORTAB 558
VORTAB 559
VORTAB 560
VORTAB 561
VORTAB 562
VORTAB 563
VORTAB 564
VORTAB 565
VORTAB 566
VORTAB 567
VORTAB 568

```

APPENDIX B. - Continued

IF(ANS.EQ.1HF)GO TO 3	VORTAB	569
PRINT *,"RE-ENTER YOUR ANSWER LEFT JUSTIFIED."	VORTAB	570
GO TO 4	VORTAB	571
C ** YES	VORTAB	572
2 WHERE=1	VORTAB	573
RETURN	VORTAB	574
C ** NO	VORTAB	575
3 WHERE=-1	VORTAB	576
RETURN	VORTAB	577
END	VORTAB	578
C	VORTAB	579
SUBROUTINE VTAIL	VORTAB	580
C ** GENERATES VERTICAL FLAT PANELS.	VORTAB	581
COMMON /FUSS/XO,YO,FSCORD,FSLOPE,BFUS,NPANS,FSCALE	VORTAB	582
DIMENSION SIDEV(2)	VORTAB	583
DIMENSION AO(3),A2(2),TOP(5),A1(3),A19(2)	VORTAB	584
REAL NVOR	VORTAB	585
DATA SPC,AINC1,AINC2,ITS,NAP,IQUANT,ISYNT,NPP/3*0.0,5*0/	VORTAB	586
DATA PDL/0.0/	VORTAB	587
DATA TOP/10HA POINT FO,10HR SPANWISE,10H LOCATION	VORTAB	588
1,10H(FROM THE ,10HTOP VIEW) /	VORTAB	589
DATA SIDEV/10H(FROM THE ,10HSIDE VIEW) /	VORTAB	590
DATA AO/10HBOTTOM LEA,10HDING POINT,1H /	VORTAB	591
DATA A1/10HBOTTOM TRA,10HILING POIN,2HT /	VORTAB	592
DATA A18/10HTOP TRAILI,9HNG POINT /	VORTAB	593
DATA A2/10HTOP LEADIN,10HG POINT /	VORTAB	594
C ** ASKS IF VERTICAL PANELS ARE DESTPED.	VORTAB	595
CALL NEWPAG	VORTAB	596
CALL ANMODE	VORTAB	597
PRINT *,"DO YOU WANT VERTICLE PANELS"	VORTAB	598
CALL YESNOF(ISLT)	VORTAB	599
IF(ISLT.LT.0)RETURN	VORTAB	600
110 CALL LINFEED(4)	VORTAB	601

APPENDIX B. - Continued

C ** GETS BOTTOM LEADING POINT.	VORTAB	602
16 CALL ADUTST(21,A0)	VORTAB	603
CALL ADUTST(20,SIDEV)	VORTAB	604
CALL RONEPNT(X1,Z1)	VORTAB	605
CALL LOCATES(X1,Z1)	VORTAB	606
CALL NEWLIN2	VORTAB	607
C ** GETS THE BOTTOM TRAILING POINT.	VORTAB	608
CALL ADUTST(22,A1)	VORTAB	609
CALL ADUTST(20,SIDEV)	VORTAB	610
CALL RONEPNT(X2,Z2)	VORTAB	611
CALL LOCATES(X2,Z2)	VORTAB	612
CORD1=SQRT((X1-X2)**2+(Z1-Z2)**2)	VORTAB	613
CALL NEWLIN2	VORTAB	614
C ** GETS TOP LEADING POINT.	VORTAB	615
CALL ADUTST(18,A2)	VORTAB	616
CALL ADUTST(20,SIDEV)	VORTAB	617
CALL RONEPNT(X3,Z3)	VORTAB	618
CALL LOCATES(X3,Z3)	VORTAB	619
CALL NEWLIN2	VORTAB	620
C ** GETS TOP TRAILING PCINT.	VORTAB	621
CALL ADUTST(19,A18)	VORTAB	622
CALL ADUTST(20,SIDEV)	VORTAB	623
CALL RONEPNT(X4,Z4)	VORTAB	624
CALL LOCATES(X4,Z4)	VORTAB	625
CORD2=SQRT((X3-X4)**2+(Z3-Z4)**2)	VORTAB	626
CALL NEWLIN2	VORTAB	627
C ** LOCATES PANEL IN SPANWISE DIRECTION.	VORTAB	628
CALL ADUTST(50, TOP)	VORTAB	629
CALL RONEPNT(AX,AY)	VORTAB	630
CALL LOCATE(AX,AY)	VORTAB	631
Y1=AY	VORTAB	632
IF(ABS(Y1).LT.4.0)Y1=0.0	VORTAB	633
C ** GETS THE NUMBER OF SPANWISE AND CHORDWISE VORTICES.	VORTAB	634
CALL NEWLIN2	VORTAB	635
CALL ANMODE	VORTAB	636

APPENDIX B. - Continued

PRINT *, "NUMBER OF SPANWISE VORTICES (NVOR)"	VORTAB	637
1016 READ (1,*)NVOR	VORTAB	638
IF(EOF(1))1016,1017	VORTAB	639
1017 PRINT *, "NUMBER OF STREAMWISE VORTICES (RNCV)"	VORTAB	640
1018 READ (1,*)RNCV	VORTAB	641
IF(EOF(1))1018,1019	VORTAB	642
1019 CALL LINFEED(6)	VORTAB	643
C ** ALLOWS THE PANEL TO BE ABORTED.	VORTAB	644
PRINT *, "DO YOU WANT THE PREVIOUS PANEL"	VORTAB	645
CALL YESNOF(NO)	VORTAB	646
IF(NO)11,21,21	VORTAB	647
21 AX=X1	VORTAB	648
AX2=X3	VORTAB	649
AY=AY2=Y1	VORTAB	650
AZ=Z1	VORTAB	651
AZ2=Z3	VORTAB	652
ACD=CORD1	VORTAB	653
ACD2=CORD2	VORTAB	654
CALL RESCALE(AX,AY,AZ,ACD,AX2,AY2,AZ2,ACD2,0.0,1)	VORTAB	655
C ** WRITES THE PANEL DATA ON DISC.	VORTAB	656
WRITE(3,100)AX,AY,AZ,ACD	VORTAB	657
WRITE(3,100)AX2,AY2,AZ2,ACD2	VORTAB	658
WRITE(3,101)NVOR,RNCV,SPC,PDL	VORTAB	659
WRITE(3,102)AINC1,AINC2,ITS,NAP,IQUANT,ISYNT,NPP	VORTAB	660
NPANS=NPANS+1	VORTAB	661
100 FORMAT(4F10.3,10X,"VERTICAL PANEL")	VORTAB	662
101 FORMAT(4F10.0,10X,"NVOR,RNCV,SPC,PDL")	VORTAB	663
102 FORMAT(2F10.2,12,8X,I2,3(9X,I1))	VORTAB	664
11 CALL NEWLIN2	VORTAB	665
C ** ALLOWS THE USER TO ADD ANOTHER PANEL IF DESIRED.	VORTAB	666
PRINT *, "DO YOU WANT ANOTHER VERTICAL PANEL"	VORTAB	667
CALL YESNOF(ISLT)	VORTAB	668
IF(ISLT.LT.0)RETURN	VORTAB	669
CALL SYSTEM(0," ")	VORTAB	670
CALL NEWPAG	VORTAB	671

APPENDIX B. - Continued

GO TO 16	VORTAB	672
END	VORTAB	673
C	VORTAB	674
SUBROUTINE NACELLE	VORTAB	675
C ** CALCULATES DATA FOR NACELLE PANELS.	VORTAB	676
COMMON /FUSS/XO,YO,FSCORD,FSLCPF,BFUS,NPANS,FSCALE	VORTAB	677
COMMON /ZXPR/ ZC(2,150),XAF(150),PHI(9),RD(9)	VORTAB	678
REAL NVOR	VORTAB	679
DIMENSION FTP(2),PHI2(9)	VORTAB	680
DATA SPC,AINC1,AINC2,ITS,IQUANT,ISYNT,NPP/3*0.0,3*0.1/	VORTAB	681
DATA PHI2/-90.0,-45.0,0.0,45.0,90.0,135.0,180.0,225.0,270.0/	VORTAB	682
DATA FTP/1CHTOP NACELL,8HE POINT /	VORTAB	683
C ** REINITIALIZES PHI ARRAY.	VORTAB	684
DO 1 J=1,9	VORTAB	685
1 PHI(J)=PHI2(J)	VORTAB	686
C ** ASKS IF NACELLES ARE DESIRED.	VORTAB	687
NLINZ=5	VORTAB	688
CALL NEWPAG	VORTAB	689
CALL ANMODE	VORTAB	690
PRINT *,"DO YOU WANT NACELLES"	VORTAB	691
CALL YESNOF(ISLT)	VORTAB	692
IF(ISLT.LT.0)RETURN	VORTAB	693
C ** FRONT TWO NACELLE POINTS.	VORTAB	694
50 PRINT 104	VORTAB	695
CALL SYSTEM(0," ")	VORTAB	696
CALL LINFEED(NLINZ)	VORTAB	697
CALL RONEPNT(X1,Y1)	VORTAB	698
CALL LOCATE(X1,Y1)	VORTAB	699
PRINT 105	VORTAB	700
CALL SYSTEM(0," ")	VORTAB	701
CALL NEWLIN2	VORTAB	702
CALL RONEPNT(X,Y)	VORTAB	703
CALL LOCATE(X,Y)	VORTAB	704

APPENDIX B. - Continued

```

R=ABS(Y1-Y)*.5
YCENTER=(Y+Y1)*.5
IF(ABS(YCENTER).LT.5.)YCENTER=0.0
NAP=1
ZC(2,1)=R*R
XAF(1)=ZC(1,1)=0.0
CALL NEWLIN2
C ** INSTRUCTIONS ARE DISPLAYED.
CALL ANMODE
PRINT *, "ENTER BODY POINTS ALONG ONE SIDE (EXCLUDING FRONT"
PRINT *, "POINTS). PROGRESSING FROM FRONT TO REAR AFTER THE"
PRINT *, "LAST POINT HAS BEEN PROCESSED ENTER Q FOLLOWED BY"
PRINT *, "A CARRIAGE RETURN."
CALL SYSTEM(0, " ")
CALL LINFEED(3)
C ** BODY POINTS READ FROM TABLET.
9 CALL TABARM(0)
CALL GETPNT(I,IX,IY)
X=FLOAT(IX)
Y=FLOAT(IY)
IF(I.EQ.81)GO TO 11
IF(I.GT.31)GO TO 9
IF(X.EQ.0.0.A.Y.EQ.0.0)GO TO 9
CALL LOCATE(X,Y)
NAP=NAP+1
R2=Y-YCENTER
ZC(2,NAP)=(R2*R2)
XAF(NAP)=X-X1
GO TO 9
11 CALL TABOFF
CORD1=XAF(NAP)
RCEP1=100.C/CORD1
DO 14 J=2,NAP
ZC(1,J)=0.0
14 XAF(J)=XAF(J)*RCEP1

```

VORTAB	705
VORTAB	706
VORTAB	707
VORTAB	708
VORTAB	709
VORTAB	710
VORTAB	711
VORTAB	712
VORTAB	713
VORTAB	714
VORTAB	715
VORTAB	716
VORTAB	717
VORTAB	718
VORTAB	719
VORTAB	720
VORTAB	721
VORTAB	722
VORTAB	723
VORTAB	724
VORTAB	725
VORTAB	726
VORTAB	727
VORTAB	728
VORTAB	729
VORTAB	730
VORTAB	731
VORTAB	732
VORTAB	733
VORTAB	734
VORTAB	735
VORTAB	736
VORTAB	737
VORTAB	738
VORTAB	739

APPENDIX B. - Continued

```

PDL=999.
C ** TOP OF NACELLE IS LOCATED VERTICALLY.
  CALL FRNTLOC(Z,FTP,18)
  CALL NEWLIN
  CALL ANMODE
  CALL SHIFT(NAP)
  Z2=Z-2.0*RO(1)
  NVOR=8.0
  IF(YCENTER)5,4,5
4 NVOR=4.0
5 NVOR1=INT(NVOR)+1
  IF(NVOR.EQ.8)Z=Z2
C ** NUMBER OF STREAMWISE VORTICES IS DETERMINED.
  PRINT 106
30 READ(1,*)RNCV
  IF(EOF(1))30,31
C ** ALLOWS PANELS TO BE ABORTED.
31 PRINT *,"DO YOU WANT THE PREVIOUS PANEL"
  CALL YESNOF(NO)
  IF(NO)99,20,20
20 NPANS=NPANS+1
  AX=AX2=X1
  AY=AY2=YCENTER
  AZ=Z2
  AZ2=Z
  ACD=ACD2=CORD1
  CALL RESCALE(AX,AY,AZ,ACD,AX2,AY2,AZ2,ACD2,999.0,NVOR1)
C ** WRITES PANEL DATA ON DISC.
  WRITE(3,100)AX,AY,AZ,ACD
  WRITE(3,100)AX2,AY2,AZ2,ACD2
  WRITE(3,101)NVOR,RNCV,SPC,PDL
  WRITE(3,102)(PHI(J),RO(J),J=1,NVOR1)
  WRITE(3,103)AINC1,AINC2,ITS,NAP,TOUANT,ISYNT,NPP
  IF(NAP.LE.2)GO TO 99
  WRITE(3,102)(XAF(J),J=1,NAP)

```

VORTAB	740
VORTAB	741
VORTAB	742
VORTAB	743
VORTAB	744
VORTAB	745
VORTAB	746
VORTAB	747
VORTAB	748
VORTAB	749
VORTAB	750
VORTAB	751
VORTAB	752
VORTAB	753
VORTAB	754
VORTAB	755
VORTAB	756
VORTAB	757
VORTAB	758
VORTAB	759
VORTAB	760
VORTAB	761
VORTAB	762
VORTAB	763
VORTAB	764
VORTAB	765
VORTAB	766
VORTAB	767
VORTAB	768
VORTAB	769
VORTAB	770
VORTAB	771
VORTAB	772
VORTAB	773
VORTAB	774

APPENDIX B. - Continued

```

      WRITE(3,102)(ZC(1,J),J=1,NAP)
      WRITE(3,102)(ZC(2,J),J=1,NAP)
C ** ALLOWS ADDITIONAL NACELLE PANELS TO BE ENTERED.
  99 PRINT *, "IS ANOTHER NACELLE DESTRED"
      CALL YESNOF(ISLT)
      IF(ISLT.LE.0) RETURN
      CALL NEWPAG
      NLINZ=2
      CALL ANMODE
      GO TO 50
100 FORMAT(4F10.3,10X,"NACELLE PANEL")
101 FORMAT(4F10.0,10X,"NVOR,RNCV,SPC,PDL")
102 FORMAT(8F10.4)
103 FORMAT(2F10.2,12,8X,I2,3(9X,I1))
104 FORMAT(" FROM THE TOP VIEW",//,
  1" INNER OR OUTER FRONT NACELLE POINT")
105 FORMAT(//," REMAINING FRONT NACELLE POINT")
106 FORMAT(//,"NUMBER OF CHORDWISE VORTICES (RNCV)")
      END
C

```

```

VORTAB      775
VORTAB      776
VORTAB      777
VORTAB      778
VORTAB      779
VORTAB      780
VORTAB      781
VORTAB      782
VORTAB      783
VORTAB      784
VORTAB      785
VORTAB      786
VORTAB      787
VORTAB      788
VORTAB      789
VORTAB      790
VORTAB      791
VORTAB      792
VORTAB      793
VORTAB      794

```

```

      SUBROUTINE SHIFT(NAP)
C ** LOCATES NACELLES IN THE VERTICAL DIRECTION.
      COMMON /ZXPR/ ZC(2,150),XAF(150),PHT(9),RD(9)
      TEST=ZC(2,1)
      DO 10 I=2,NAP
10 IF(ZC(2,I).GT.TEST)TEST=ZC(2,I)
      R=SQRT(TEST)
      DO 11 J=1,9
11 RD(J)=R
      REFAREA=TEST*.01
      DO 12 J=1,NAP
12 ZC(2,J)=ZC(2,J)/REFAREA
      RETURN

```

```

VORTAB      795
VORTAB      796
VORTAB      797
VORTAB      798
VORTAB      799
VORTAB      800
VORTAB      801
VORTAB      802
VORTAB      803
VORTAB      804
VORTAB      805
VORTAB      806
VORTAB      807

```


APPENDIX B. - Continued

END	VORTAB	808
C	VORTAB	809
SUBROUTINE FUSLAGE(YLOC)	VORTAB	810
C ** THIS GENERATES THE FUSELAGE PANFLS.	VORTAB	811
COMMON /FUSS/XO,YO,FSCORD,FSLOPE,RFUS,NPANS,FSCALE	VORTAB	812
COMMON /FUSS2/RNOT,NAP	VORTAB	813
COMMON /ZXPR/ ZC(2,150),XAF(150),PHI(9),RQ(9)	VORTAB	814
COMMON /ZSEA/ ZC2(2,50),XAF2(50)	VORTAB	815
REAL NVOR,KORD	VORTAB	816
DIMENSION PHI2(9)	VORTAB	817
DATA SPC,AINC1,AINC2,ITS,IQUANT,TSYNT,NPP/3*0.0,-1,0,0,1/	VORTAB	818
DATA PHI2/-90.0,-45.0,0.0,45.0,90.0,135.0,180.0,225.0,270.0/	VORTAB	819
C ** GETS NOSE POINT FROM TOP VIEW.	VORTAB	820
50 PRINT *,"ENTER NOSE POINT FROM TOP VIEW"	VORTAB	821
CALL SYSTEM(0," ")	VORTAB	822
CALL LINFEED(4)	VORTAB	823
CALL RONEPNT(ANYX,YLOC)	VORTAB	824
CALL LOCATE(ANYX,YLOC)	VORTAB	825
IF(YLOC.LT.3.0)YLOC=0.0	VORTAB	826
YLOC=ABS(YLOC)	VORTAB	827
CALL NEWPAG	VORTAB	828
NO=1	VORTAB	829
CALL LINFEED(2)	VORTAB	830
PDL2=999.	VORTAB	831
C ** INITIALIZES PHI ARRAY.	VORTAB	832
DO 1 J=1,9	VORTAB	833
1 PHI(J)=PHI2(J)	VORTAB	834
C ** INSTRUCTIONS ARE TO BE PRINTED.	VORTAB	835
NLINES=6	VORTAB	836
CALL ANMODE	VORTAB	837
PRINT 321	VORTAB	838
321 FORMAT(" TO MAKE A FUSELAGE BODY ENTER POINTS FROM THE SIDE",	VORTAB	839
1" VIEW. THE NOSE POINT IS FIRST. THE NEXT POINTS ARE "	VORTAB	840
2"ENTERED IN",/," PAIRS, THE FIRST FROM THE TOP OF THE FUSELAGE"	VORTAB	841

APPENDIX B. - Continued

64

3", THE SECOND FROM THE BOTTOM DIRECTLY BELOW THE FIRST.",/,	VORTAB	842
4" THE LAST TWO COME FROM THE END OF THE FUSELAGE, AFTER"	VORTAB	843
5" THESE TWO ENTER 0 TO END",//," NOSE POINT")	VORTAB	844
C ** GETS NOSE PCINT.	VORTAB	845
41 CALL SYSTEM(0," ")	VORTAB	846
CALL LINFEED(NLINES)	VORTAB	847
CALL RONEPNT(X1,Z1)	VORTAB	848
CALL LOCATES(X1,Z1)	VORTAB	849
IF(ABS(Z1).LT.3.0)Z1=0.0	VORTAB	850
ZLOC=Z1	VORTAB	851
IF(ABS(X1).LT.3.0)X1=0.0	VORTAB	852
XAF1=X1	VORTAB	853
XAF(1)=0.0	VORTAB	854
ZC(1,1)=0.0	VORTAB	855
ZC(2,1)=0.0	VORTAB	856
NAP=1	VORTAB	857
C ** GETS BODY PCINTS.	VORTAB	858
90 PRINT *, " TOP POINT"	VORTAB	859
CALL SYSTEM(0," ")	VORTAB	860
CALL NEWLIN	VORTAB	861
9 CALL TABARM(0)	VORTAB	862
CALL GETPNT(I,IX,IZ)	VORTAB	863
X=FLOAT(IX)	VORTAB	864
Z=FLOAT(IZ)	VORTAB	865
IF(I.EQ.81)GO TO 11	VORTAB	866
IF(I.GT.31)GO TO 9	VORTAB	867
CALL LOCATES(X,Z)	VORTAB	868
PRINT *, " BOTTOM POINT"	VORTAB	869
CALL SYSTEM(0," ")	VORTAB	870
CALL NEWLIN	VORTAB	871
209 CALL TABARM(0)	VORTAB	872
CALL GETPNT(I,IX2,IZ2)	VORTAB	873
IF(I.EQ.81)GO TO 11	VORTAB	874
IF(I.GT.31)GO TO 209	VORTAB	875
X2=FLOAT(IX2)	VORTAB	876
Z2=FLOAT(IZ2)	VORTAB	877

APPENDIX B. - Continued

```

CALL LOCATES(X2,Z2)
NAP=NAP+1
XAF(NAP)=X-XAF1
ZC(2,NAP)=((Z -Z2)*.5)**2
ZC(1,NAP)=(Z +Z2)*.5-ZLOC
GO TO 90
11 CALL TABOFF
CALL NEWLIN2
CALL ANMODE
C ** ALLOWS DATA TO BE RE-ENTERED IF AN ERROR HAS BEEN MADE.
PRINT *, "DO YOU WANT TO RE-ENTER THIS DATA"
CALL YESNOF(LBODY)
IF(LBODY.LT.0)GO TO 40
PRINT *, "RE-ENTER FUSELAGE DATA."
CALL NEWLIN
GO TO 50
40 I2=INT(.5*NAP)+1
C ** DATA IS PUT IN TERMS OF %-CHORD.
CORD1=XAF(NAP)
CRDNRM=100.0/CORD1
RNOT=SQRT(ZC(2,I2))
RNORM=100.0/ZC(2,I2)
DO 12 J=1,NAP
ZC(1,J)=ZC(1,J)*CRDNRM
XAF(J)=XAF(J)*CRDNRM
12 ZC(2,J)=ZC(2,J)*RNORM
C ** RADII OF FUSELAGE ARE DETERMINED.
DO 13 J=1,9
13 RO(J)=RNOT
PDL=999.
Z2=Z--RNOT
NVOR=8.0
IF(YLOC)5,4,5
4 NVOR=4
Z=Z2+2.0*RNOT
5 NVOR1=1+INT(NVOR)

```

VORTAB	878
VORTAB	879
VORTAB	880
VORTAB	881
VORTAB	882
VORTAB	883
VORTAB	884
VORTAB	885
VORTAB	886
VORTAB	887
VORTAB	888
VORTAB	889
VORTAB	890
VORTAB	891
VORTAB	892
VORTAB	893
VORTAB	894
VORTAB	895
VORTAB	896
VORTAB	897
VORTAB	898
VORTAB	899
VORTAB	900
VORTAB	901
VORTAB	902
VORTAB	903
VORTAB	904
VORTAB	905
VORTAB	906
VORTAB	907
VORTAB	908
VORTAB	909
VORTAB	910
VORTAB	911
VORTAB	912
VORTAB	913

APPENDIX B. - Continued

```

      IF(NVOR.EQ.8)Z=Z2
C ** FUSELAGE CAMBER CAN BE ADDED HERF.
      CALL RELOCAT(YLOC,ZLOC,CORD1,X1)
      Z2=Z2+ZLOC
      Z=Z+ZLOC
C ** ASKS FOR NUMBER OF FUSELAGE PANFLS.
      55 PRINT *,"NUMBER OF FUSELAGE PANELS"
      56 READ(1,*)NUM
      IF(EOF(1))58,57
      58 CALL LINEF
      GO TO 56
      57 IF(NUM.GT.0.A.NUM.LT.5)GO TO 10
      PRINT *,"RE-ENTER YOUR NUMBER BETWEEN 0 AND 5"
      CALL LINFEED(3)
      GO TO 55
C ** ALLOWS MULTIPLE FUSELAGE PANELS.
      10 IF(NO.EQ.1)NPANS=NPANS+NUM
      XAF2(1)=XAF(1)
      ZC2(1,1)=ZC(1,1)
      ZC2(2,1)=ZC(2,1)
      ANDT=0.0
      NO=1
      JTWO=1
      NLINZZ=7
C ** LOOP TO MAKE MULTIPLE FUSELAGE PANFLS.
      DO 30 IMP=1,NUM
      54 JNOT=JTWO
      IF(IMP.EQ.NUM)GO TO 22
      PRINT 104,IMP
      104 FORMAT(" ENTER BREAK POINT FOR PANEL # ",I1,
      1" ,(FROM THE TOP VIEW)")
      CALL SYSTEM(0," ")
      CALL LINFEED(NLINZZ)
      NLINZZ=8
      CALL RONEPNT(AX,AZ)
      CALL LOCATES(AX,AZ)

```

```

VORTAB 914
VORTAB 915
VORTAB 916
VORTAB 917
VORTAB 918
VORTAB 919
VORTAB 920
VORTAB 921
VORTAB 922
VORTAB 923
VORTAB 924
VORTAB 925
VORTAB 926
VORTAB 927
VORTAB 928
VORTAB 929
VORTAB 930
VORTAB 931
VORTAB 932
VORTAB 933
VORTAB 934
VORTAB 935
VORTAB 936
VORTAB 937
VORTAB 938
VORTAB 939
VORTAB 940
VORTAB 941
VORTAB 942
VORTAB 943
VORTAB 944
VORTAB 945
VORTAB 946
VORTAB 947
VORTAB 948
VORTAB 949

```

APPENDIX B. - Continued

```

      AX=AX-XAF1
      GO TO 23
22  AX=XAF(NAP)*CORD1*.01
      JTWO=NAP
23  KORD=AX-ANOT
      IF(IMP.EQ.1)GO TO 36
C ** FIRST POINT OF PANEL IS DETERMINED.
      ZC2(1,1)=ZC2(1,NAP1)*OLDCORD/KORD
      ZC2(2,1)=ZC2(2,NAP1)
      XAF2(1)=0.0
36  X11=ANOT
      OLDCORD=KORD
      SAFANOT=ANOT
      SAFJTWO=JTWO
      ANOT=AX
C ** NUMBER OF CHORDWISE VORTICES IS DETERMINED.
      IF(IMP.NE.NUM)PRINT 105
105  FORMAT(/)
      PRINT *,"NUMBER OF CHORDWISE VORTICES (RNCV)"
      PRINT *,"FOR PANEL NUMBER ",IMP
28  READ(1,*)RNCV
      IF(EOF(1))60,29
60  CALL LINEF
      GO TO 28
29  PCORD=100.*AX/CORD1
      IF(IMP.EQ.NUM)GO TO 26
      DO 31 J=JNOT,NAP
31  IF(XAF(J).GT.PCORD)GO TO 32
32  JTWO=J
C ** DATA AT PANEL JOINING POINTS ARE CALCULATED.
      NAPP=JTWO-JNOT+2
      IF(IMP.EQ.1)NAPP=JTWO
      RATIO=(PCORD-XAF(J-1))/(XAF(J)-XAF(J-1))
      ZC2(1,NAPP)=RATIO*(ZC(1,J)-ZC(1,J-1))+ZC(1,J-1)
      ZC2(2,NAPP)=RATIO*(SORT(ZC(2,J))-SORT(ZC(2,J-1)))+SORT(ZC(2,J-1))
      ZC2(2,NAPP)=ZC2(2,NAPP)**2

```

VORTAB	950
VORTAB	951
VORTAB	952
VORTAB	953
VORTAB	954
VORTAB	955
VORTAB	956
VORTAB	957
VORTAB	958
VORTAB	959
VORTAB	960
VORTAB	961
VORTAB	962
VORTAB	963
VORTAB	964
VORTAB	965
VORTAB	966
VORTAB	967
VORTAB	968
VORTAB	969
VORTAB	970
VORTAB	971
VORTAB	972
VORTAB	973
VORTAB	974
VORTAB	975
VORTAB	976
VORTAB	977
VORTAB	978
VORTAB	979
VORTAB	980
VORTAB	981
VORTAB	982
VORTAB	983
VORTAB	984
VORTAB	985

APPENDIX B. - Continued

```

      XAF2(NAPP)=PCORD
      GO TO 27
C ** CALCULATES THE PARAMETERS TO MODIFY DATA FOR THE
C ** APPROPRIATE PANELS.
  26 NAPP=JTWO-JNOT+2
      IF(NUM.EQ.1)NAPP=NAP
  27 ZC1FUG=CORD1/KORD
      XAFFUG1=ZC1FUG
      XAFFUG2=-100.*X11/KORD
      IF(IMP.EQ.1)XAFFUG2=0.0
      IF(IMP.EQ.NUM)GO TO 37
      ZC2(1,NAPP)=ZC2(1,NAPP)*ZC1FUG
      XAF2(NAPP)=XAF2(NAPP)*XAFFUG1+XAFFUG2
  37 JNO=JNOT-1
      JTW=JTWO-1
      NAP1=NAPP
      IF(IMP.EQ.NUM)JTW=JTW
      IF(IMP.GT.1)JNO=JNC-1
      IF(NAPP.EQ.2.A.IMP.LT.NUM)GO TO 333
C ** MODIFIES DATA FOR THE APPROPRIATE PANEL AND WRITES IT
C ** ON DISC.
      DO 33 JINC=JNOT,JTW
      JFUG=JINC-JNO
      ZC2(1,JFUG)=ZC(1,JINC)*ZC1FUG
      ZC2(2,JFUG)=ZC(2,JINC)
  33 XAF2(JFUG)=XAF(JINC)*XAFFUG1+XAFFUG2
  333 CONTINUE
C ** ALLOWS A PANEL TO BE ABORTED.
      PRINT *,"DO YOU WANT THE PREVIOUS PANEL"
      CALL YESNOF(NO)
      IF(NO)552,20,20
  20 IF(NAP1.EQ.2)CALL NAPE2(NAP1)
C ** VARIABLES ARE PREPARED FOR RE-SCALING.
      AX=AX2=X11+XAF1
      AY=AY2=YLOC
      AZ=Z2

```

```

VORTAB 986
VORTAB 987
VORTAB 988
VORTAB 989
VORTAB 990
VORTAB 991
VORTAB 992
VORTAB 993
VORTAB 994
VORTAB 995
VORTAB 996
VORTAB 997
VORTAB 998
VORTAB 999
VORTAB 1000
VORTAB 1001
VORTAB 1002
VORTAB 1003
VORTAB 1004
VORTAB 1005
VORTAB 1006
VORTAB 1007
VORTAB 1008
VORTAB 1009
VORTAB 1010
VORTAB 1011
VORTAB 1012
VORTAB 1013
VORTAB 1014
VORTAB 1015
VORTAB 1016
VORTAB 1017
VORTAB 1018
VORTAB 1019
VORTAB 1020
VORTAB 1021

```

APPENDIX B. - Continued

AZ2=Z	VORTAB	1022
ACD=ACD2=KORD	VORTAB	1023
CALL RESCALE(AX,AY,AZ,ACD,AX2,AY2,AZ2,ACD2,PDL2,NVOR1)	VORTAB	1024
PDL2=0.0	VORTAB	1025
C ** WRITES PANEL DATA ON DISC	VORTAB	1026
WRITE(3,100)AX,AY,AZ,ACD	VORTAB	1027
WRITE(3,100)AX2,AY2,AZ2,ACD2	VORTAB	1028
WRITE(3,101)NVOR,RNCV,SPC,PDL	VORTAB	1029
WRITE(3,102)(PHI(J),RG(J),J=1,NVOP1)	VORTAB	1030
WRITE(3,103)AINC1,AINC2,ITS,NAP1,TOHANT,ISYNT,NPP	VORTAB	1031
WRITE(3,102)(XAF2(J),J=1,NAP1)	VORTAB	1032
WRITE(3,102)(ZC2(1,J),J=1,NAP1)	VORTAB	1033
WRITE(3,102)(ZC2(2,J),J=1,NAP1)	VORTAB	1034
GO TO 30	VORTAB	1035
552 JTWO=SAFJTWO	VORTAB	1036
ZC2(1,NAP1)=ZC2(1,1)	VORTAB	1037
ZC2(2,NAP1)=ZC2(2,1)	VORTAB	1038
ANDT=SAFANDT	VORTAB	1039
GO TO 54	VORTAB	1040
30 CONTINUE	VORTAB	1041
100 FORMAT(4F10.3,10X,"FUSELAGE PANEL")	VORTAB	1042
101 FORMAT(4F10.3,10X,"NVOR,RNCV,SPC,PDL")	VORTAB	1043
102 FORMAT(8F10.4)	VORTAB	1044
103 FORMAT(2F10.2,I2,8X,I2,3(9X,I1))	VORTAB	1045
IF(YLCC.NE.0)RETURN	VORTAB	1046
PRINT *,"IS ANOTHER FUSELAGE REQUIRED"	VORTAB	1047
CALL YESNOF(INOTHER)	VORTAB	1048
CALL SYSTEM(0," ")	VORTAB	1049
CALL NEWPAG	VORTAB	1050
CALL ANMODE	VORTAB	1051
IF(INOTHER.LT.0)RETURN	VORTAB	1052
NO=1	VORTAB	1053
GO TO 50	VORTAB	1054
END	VORTAB	1055
C	VORTAB	1056

APPENDIX B. - Continued

```

SUBROUTINE NAPE2(NAP1)
C ** CHANGES ONE SEGMENT PANELS INTO TWO SEGMENT PANELS.
COMMON /ZSEA/ ZC2(2,50),XAF2(50)
NAP1=3
XAF2(2)=50.0
XAF2(3)=100.0
ZC2(1,3)=ZC2(1,2)
ZC2(2,3)=ZC2(2,2)
ZC2(1,2)=(ZC2(1,3)+ZC2(1,1))*0.5
S1=SQRT(ZC2(2,3))
S2=SQRT(ZC2(2,1))
ZC2(2,2)=((S1+S2)*0.5)**2
RETURN
END

```

```

VORTAB 1057
VORTAB 1058
VORTAB 1059
VORTAB 1060
VORTAB 1061
VORTAB 1062
VORTAB 1063
VORTAB 1064
VORTAB 1065
VORTAB 1066
VORTAB 1067
VORTAB 1068
VORTAB 1069
VORTAB 1070
VORTAB 1071

```

```

SUBROUTINE RELOCAT(YLOC,ZLOC,FSCORD,XSTART)
C ** ALLOWS WINGS TO BE ATTACHED TO THE FUSELAGE.
COMMON /ZXPR/ ZC(2,150),XAF(150),PHI(9),RQ(9)
COMMON /FUSS2/RNQT,NAP
COMMON /WING/ AWX(3),AWY(3),AWZ(3,1))=
DIMENSION TEST(3)
DATA PIE/3.13159/
IF(MODE.EQ.-1)RETURN
C ** LOCATES THE STARTING POINT OF THE WING WITH
C ** RESPECT TO THE FUSELAGE.
IWWW=1
IF(YLOC.EQ.0)GO TO 1
IWWW=2
1 WX=AWX(IWWW)-XSTART
WY=AWY(IWWW)
WZ=AWZ(IWWW)
AWZ(3)=WZ
PCORD=(100.0*WX)/FSCORD
WY=ABS(WY-YLOC)

```

```

VORTAB 1072
VORTAB 1073
VORTAB 1074
VORTAB 1075
VORTAB 1076
VORTAB 1077
VORTAB 1078
VORTAB 1079
VORTAB 1080
VORTAB 1081
VORTAB 1082
VORTAB 1083
VORTAB 1084
VORTAB 1085
VORTAB 1086
VORTAB 1087
VORTAB 1088
VORTAB 1089
VORTAB 1090

```


APPENDIX B. - Continued

```

      IF(YLOC.GT.0)AWY(3)=YLOC+WY
C ** DETERMINES WHICH %-CHORD STATIONS STARTING POINT OF
C ** WING IS BETWEEN.
      DO 2 J=2,NAP
    2 IF(XAF(J).GT.PCORD)GO TO 3
    3 RATIO=(PCORD-XAF(J-1))/(XAF(J)-XAF(J-1))
      ZSHIFT=ZC(1,J-1)+(ZC(1,J)-ZC(1,J-1))*RATIO
      DO 10 IJK=1,NAP
    10 ZC(1,IJK)=ZC(1,IJK)-ZSHIFT
      ZLOC=ZLOC+ZSHIFT*.01*FSCORD
      WZ=WZ-ZLOC
      RAD1=SQRT(ZC(2,J-1))+(SQRT(ZC(2,J))-SQRT(ZC(2,J-1)))*RATIO
      RAD1=RAD1*.1
      RADIUS=RAD1*RNOT
C ** DISTANCES BETWEEN WING & FUSELAGE SUBPANELS ARE DETERMINED.
    11 DO 30 I=1,3
      FI=PIE/180.0*PHI(I+1)
      ZTEM=SIN(FI)*RADIUS
      YTEM=COS(FI)*RADIUS
    30 TEST(I)=SQRT((WZ-ZTEM)**2+(WY-YTEM)**2)
      TEST1=TEST(1)
      TEST2=TEST(2)
      TEST3=TEST(3)
C ** SUBPANEL BOUNDARY CLOSEST TO THE WING IS SELECTED.
      IF(TEST1.LT.TEST2.A.TEST1.LT.TEST3)GO TO 40
      IF(TEST2-TEST3)38,38,39
    38 ITEST=3
      GO TO 41
    39 ITEST=4
      GO TO 41
    40 ITEST=2
C ** SHIFTS A SUBPANEL BOUNDARY TO CORRESPOND TO WING ROOT.
    41 ROTEST=SQRT(WZ*WZ+WY*WY)
      RO(ITEST)=ROTEST2=ROTEST/RAD1
      PHI(ITEST)=PHIT=ASIN(WZ/ROTEST)*180.0/PIE
      DELTAR=(ROTEST2-RNOT)

```

VORTAB	1091
VORTAB	1092
VORTAB	1093
VORTAB	1094
VORTAB	1095
VORTAB	1096
VORTAB	1097
VORTAB	1098
VORTAB	1099
VORTAB	1100
VORTAB	1101
VORTAB	1102
VORTAB	1103
VORTAB	1104
VORTAB	1105
VORTAB	1106
VORTAB	1107
VORTAB	1108
VORTAB	1109
VORTAB	1110
VORTAB	1111
VORTAB	1112
VORTAB	1113
VORTAB	1114
VORTAB	1115
VORTAB	1116
VORTAB	1117
VORTAB	1118
VORTAB	1119
VORTAB	1120
VORTAB	1121
VORTAB	1122
VORTAB	1123
VORTAB	1124
VORTAB	1125
VORTAB	1126

APPENDIX B. - Continued

C ** MAKES SIZE OF SUBPANELS AROUND FUSELAGE MORE EQUAL.	VORTAB	1127
IF(ITEST-3)50,51,52	VORTAB	1128
50 PHIINC=(90.0-PHIT)/3.0	VORTAB	1129
DELT=DELTARO/3.0	VORTAB	1130
PHI(3)=PHIT+PHIINC	VORTAB	1131
PHI(4)=PHIT+PHIINC*2.0	VORTAB	1132
RO(3)=RNOT+DELT*2.0	VORTAB	1133
RO(4)=RNOT+DELT	VORTAB	1134
GO TO 53	VORTAB	1135
51 RO(2)=RO(4)=RNOT+.5*DELTARO	VORTAB	1136
PHI(4)=45.0+.5*PHIT	VORTAB	1137
PHI(2)=-45.0+.5*PHIT	VORTAB	1138
GO TO 53	VORTAB	1139
52 PHIINC=(90.0+PHIT)/3.0	VORTAB	1140
DELT=DELTARL/3.0	VORTAB	1141
PHI(2)=PHIINC-90.	VORTAB	1142
PHI(3)=2.0*PHIINC-90.	VORTAB	1143
RO(2)=RNOT+DELT	VORTAB	1144
RO(3)=RNOT+DELT*2.0	VORTAB	1145
C ** MAKES THE SECOND HALF OF THE FUSELAGE A MIRROR IMAGE	VORTAB	1146
C ** OF THE FIRST HALF.	VORTAB	1147
53 PHI(8)=180.0-PHI(2)	VORTAB	1148
PHI(7)=180.0-PHI(3)	VORTAB	1149
PHI(6)=180.0-PHI(4)	VORTAB	1150
RO(8)=RO(2)	VORTAB	1151
RO(7)=RO(3)	VORTAB	1152
RO(6)=RO(4)	VORTAB	1153
RETURN	VORTAB	1154
END	VORTAB	1155
C	VORTAB	1156
SUBROUTINE FIRST6(NPAN)	VORTAB	1157
C ** THIS GENERATES THE FIRST 6 CARDS OF THE DATA DECK.	VORTAB	1158
INTEGER WHERE	VORTAB	1159
DIMENSION TITLE(8),RMACH(7),ALPHA(7)	VORTAB	1160

APPENDIX B. - Continued

C ** A SHORT EXPLANATION OF THE CARD NUMBERS.	VORTAB	1161
PRINT *, "THE CARD NUMBERS CORRESPOND TO THE CARD NUMBERS"	VORTAB	1162
PRINT *, "AS GIVEN IN THE DOCUMENT FOR THE VORLAX PROGRAM."	VORTAB	1163
C ** CARD NUMBER 1	VORTAB	1164
71 PRINT *, "ENTER THE DATA FOR CARD NUMBER 1."	VORTAB	1165
PRINT *, "ENTER TITLE FOR THE AIRCRAFT CONFIGURATION"	VORTAB	1166
200 READ 100, TITLE	VORTAB	1167
IF (EOF(1)) 200, 201	VORTAB	1168
201 CALL PRINTC(1, WHERE)	VORTAB	1169
IF (WHERE) 42, 42, 71	VORTAB	1170
42 WRITE(7, 100) TITLE	VORTAB	1171
100 FORMAT(8A10)	VORTAB	1172
C ** CARD NUMBER 2	VORTAB	1173
72 PRINT *, "ENTER THE DATA FOR CARD NUMBER 2."	VORTAB	1174
PRINT *, "METHOD OF SOLVING THE SYSTEM OF EQUATIONS RELATING"	VORTAB	1175
PRINT *, "BOUNDARY CONDITIONS TO VORTICITY STRENGTH (ISOLVE)"	VORTAB	1176
10 PRINT *, "0 FOR GAUSS-SEIDEL"	VORTAB	1177
PRINT *, "1 FOR PURCELL'S VECTOR ORTHOGONALIZATION"	VORTAB	1178
202 READ (1, *) ISOLVE	VORTAB	1179
IF (EOF(1)) 202, 203	VORTAB	1180
203 IF (ISOLVE.EQ.0.OR.ISOLVE.EQ.1) GO TO 11	VORTAB	1181
GO TO 10	VORTAB	1182
11 PRINT *, "CHORDWISE SPACING OF VORTICES (LAX)"	VORTAB	1183
12 PRINT *, "0 FOR COSINE LAW SPACING"	VORTAB	1184
PRINT *, "1 FOR LINEAR SPACING"	VORTAB	1185
204 READ (1, *) LAX	VORTAB	1186
IF (EOF(1)) 204, 205	VORTAB	1187
205 IF (LAX.EQ.1.OR.LAX.EQ.0) GO TO 13	VORTAB	1188
GO TO 12	VORTAB	1189
13 PRINT *, "SPANWISE SPACING OF VORTICES (LAY)"	VORTAB	1190
14 PRINT *, "0 FOR COSINE LAW SPACING"	VORTAB	1191
PRINT *, "1 FOR LINEAR SPACING"	VORTAB	1192
206 READ (1, *) LAY	VORTAB	1193
IF (EOF(1)) 206, 207	VORTAB	1194
207 IF (LAY.EQ.1.OR.LAY.EQ.0) GO TO 15	VORTAB	1195
GO TO 14	VORTAB	1196

APPENDIX B. - Continued

15	REXP=0.0	VORTAB	1197
	IF(ISOVE.EQ.1)GO TO 17	VORTAB	1198
	PRINT *, "INPUT THE OVER-RELAXATION PARAMETER (REXP)"	VORTAB	1199
	PRINT *, "INPUT 0.0 FOR MACHINE DETERMINED OPTIMUM"	VORTAB	1200
60	PRINT *, "0.0 <= REXP < .99"	VORTAB	1201
208	READ (1,*)REXP	VORTAB	1202
	IF(EOF(1))208,209	VORTAB	1203
209	IF(REXP.GE.0.0.A.REXP.LT..99)GO TO 17	VORTAB	1204
	GO TO 60	VORTAB	1205
17	PRINT *, "HEIGHT ABOVE GROUND (HAG),"	VORTAB	1206
	PRINT *, "ENTER 0.0 FOR NO GROUND EFFECT"	VORTAB	1207
210	READ (1,*)HAG	VORTAB	1208
	IF(EOF(1))210,211	VORTAB	1209
211	PRINT *, "LONGITUDINAL VORTEX WAKE FLOTATION FACTOR (FLOATX)"	VORTAB	1210
212	READ (1,*)FLOATX	VORTAB	1211
	IF(EOF(1))212,213	VORTAB	1212
213	PRINT *, "LATERAL VORTEX WAKE FLOTATION FACTOR (FLOATY)"	VORTAB	1213
214	READ (1,*)FLOATY	VORTAB	1214
	IF(EOF(1))214,215	VORTAB	1215
215	ITRMAX=0	VORTAB	1216
	IF(ISOVE.EQ.1)GO TO 20	VORTAB	1217
	PRINT *, "MAXIMUM NUMBER OF ITERATIONS FOR THE GAUSS-SEIDEL"	VORTAB	1218
	PRINT *, "RELAXATION METHOD (ITRMAX)"	VORTAB	1219
	PRINT *, "IF 0 IS ENTERED DEFAULT OF 99 WILL BE USED"	VORTAB	1220
216	READ (1,*)ITRMAX	VORTAB	1221
	IF(EOF(1))216,20	VORTAB	1222
20	CALL PRINTC(2,WHERE)	VORTAB	1223
	IF(WHERE)43,43,72	VORTAB	1224
43	WRITE(7,101)ISOVE,LAX,LAY,REXP,HAG,FLOATX,FLOATY,ITRMAX	VORTAB	1225
101	FORMAT(1X,I1,9X,I1,9X,I1,8X,4F10.3,7X,I3)	VORTAB	1226
C	** CARD NUMBER 3	VORTAB	1227
73	PRINT *, "ENTER THE DATA FOR CARD NUMBER 3."	VORTAB	1228
	PRINT *, "NUMBER OF MACH NUMBERS TO BE ANALYZED (NMACH)"	VORTAB	1229
50	PRINT *, "<=7"	VORTAB	1230
217	READ (1,*)NMACH	VORTAB	1231
	IF(EOF(1))217,218	VORTAB	1232

APPENDIX B. - Continued

218 IF(NMACH.GT.7)GO TO 50	VORTAB	1233
IF(NMACH.EQ.0)GO TO 55	VORTAB	1234
DO 51 J=1,NMACH	VORTAB	1235
PRINT *, "INPUT MACH NUMBER # ",J	VORTAB	1236
300 READ (1,*)RMACH(J)	VORTAB	1237
IF(EOF(1))300,51	VORTAB	1238
51 CONTINUE	VORTAB	1239
55 CALL PRINTC(3,WHERE)	VORTAB	1240
IF(WHERE)44,44,73	VORTAB	1241
44 WRITE(7,103)NMACH,(RMACH(J),J=1,NMACH)	VORTAB	1242
103 FORMAT(I2,8X,7F10.3)	VORTAB	1243
C ** CARD NUMBER 4	VORTAB	1244
74 PRINT *, "ENTER THE DATA FOR CARD NUMBER 4."	VORTAB	1245
PRINT *, "NUMBER OF ANGLES OF ATTACK (NALPHA)"	VORTAB	1246
52 PRINT *, "<= 7"	VORTAB	1247
219 READ (1,*)NALPHA	VORTAB	1248
IF(EOF(1))219,220	VORTAB	1249
220 IF(NALPHA.GT.7)GO TO 52	VORTAB	1250
IF(NALPHA.EQ.0)GO TO 54	VORTAB	1251
DO 57 J=1,NALPHA	VORTAB	1252
PRINT *, "INPUT ANGLE # ",J," IN DEGREES"	VORTAB	1253
301 READ (1,*)ALPHA(J)	VORTAB	1254
IF(EOF(1))301,57	VORTAB	1255
57 CONTINUE	VORTAB	1256
54 CALL PRINTC(4,WHERE)	VORTAB	1257
IF(WHERE)45,45,74	VORTAB	1258
45 WRITE(7,103)NALPHA,(ALPHA(J),J=1,NALPHA)	VORTAB	1259
C ** CARD NUMBER 5	VORTAB	1260
75 PRINT *, "ENTER THE DATA FOR CARD NUMBER 5."	VORTAB	1261
PRINT *, "ASYMMETRIC FLIGHT OR CONFIGURATION FLAG (LATRAL)"	VORTAB	1262
30 PRINT *, "0 FOR SYMMETRIC FLIGHT AND CONFIGURATION"	VORTAB	1263
PRINT *, "1 FOR ASYMMETRIC FLIGHT AND/OR CONFIGURATION"	VORTAB	1264
221 READ (1,*)LATRAL	VORTAB	1265
IF(EOF(1))221,222	VORTAB	1266
222 IF(LATRAL.EQ.0)GO TO 31	VORTAB	1267
IF(LATRAL.EQ.1)GO TO 31	VORTAB	1268

APPENDIX B. - Continued

GO TO 30	VORTAB	1269
31 PSI=0.0	VORTAB	1270
IF(LATRAL.EQ.0)GO TO 32	VORTAB	1271
PRINT *,"SIDESLIP ANGLE IN DEGREES (PSI)"	VORTAB	1272
223 READ (1,*)PSI	VORTAB	1273
IF(EOF(1))223,32	VORTAB	1274
32 PRINT *,"PITCH RATE IN DEGREES/SECOND (PITCHQ)"	VORTAB	1275
224 READ (1,*)PITCHQ	VORTAB	1276
IF(EOF(1))224,225	VORTAB	1277
225 ROLLQ=YAWQ=0.0	VORTAB	1278
IF(LATRAL.EQ.0)GO TO 33	VORTAB	1279
PRINT *,"ROLL RATE IN DEGREES/SECOND (ROLLQ)"	VORTAB	1280
226 READ (1,*)ROLLQ	VORTAB	1281
IF(EOF(1))226,227	VORTAB	1282
227 PRINT *,"YAW RATE IN DEGREES/SECOND (YAWQ)"	VORTAB	1283
228 READ (1,*)YAWQ	VORTAB	1284
IF(EOF(1))228,33	VORTAB	1285
33 IF(PITCHQ.NE.0)GO TO 34	VORTAB	1286
IF(YAWQ.NE.0)GO TO 34	VORTAB	1287
IF(ROLLQ.NE.0)GO TO 34	VORTAB	1288
VINF=0.0	VORTAB	1289
GO TO 35	VORTAB	1290
34 PRINT *,"REFERENCE FREE STREAM VELOCITY (VINF)"	VORTAB	1291
PRINT *,"IF 0.0 IS ENTERED DEFAULT OF 1.0 IS USED"	VORTAB	1292
229 READ (1,*)VINF	VORTAB	1293
IF(EOF(1))229,35	VORTAB	1294
35 CALL PRINTC(5,WHERE)	VORTAB	1295
IF(WHERE)46,46,75	VORTAB	1296
46 WRITE(7,104)LATRAL,PSI,PITCHQ,ROLLQ,YAWQ,VINF	VORTAB	1297
104 FORMAT(1X,11,8X,5F10.3)	VORTAB	1298
C ** CARD NUMBER 6	VORTAB	1299
76 PRINT *,"ENTER THE DATA FOR CARD NUMBER 6."	VORTAB	1300
PRINT *,"REFERENCE AREA FOR FORCE AND MOMENT COEFFICIENTS (SREF)"	VORTAB	1301
230 READ (1,*)SREF	VORTAB	1302
IF(EOF(1))230,231	VORTAB	1303
231 PRINT *,"PITCHING MOMENT COEFFICIENT REFERENCE LENGTH"	VORTAB	1304

APPENDIX B. - Continued

PRINT *, "USUALLY MEAN AERODYNAMIC CHORD LENGTH (CBAR)"	VORTAB	1305
232 READ (1,*)CBAR	VORTAB	1306
IF(EOF(1))232,233	VORTAB	1307
233 PRINT *, "X-COORDINATE OF MOMENT REFERENCE POINT (XBAR)"	VORTAB	1308
234 READ (1,*)XBAR	VORTAB	1309
IF(EOF(1))234,235	VORTAB	1310
235 PRINT *, "Z-COORDINATE OF MOMENT REFERENCE POINT (ZBAR)"	VORTAB	1311
236 READ (1,*)ZBAR	VORTAB	1312
IF(EOF(1))236,237	VORTAB	1313
237 PRINT *, "TOTAL WING SPAN IN UNITS OF SREF AND CBAR (WSPAN)"	VORTAB	1314
238 READ (1,*)WSPAN	VORTAB	1315
IF(EOF(1))238,239	VORTAB	1316
239 CALL PRINTC(6,WHERE)	VORTAB	1317
IF(WHERE)47,47,76	VORTAB	1318
47 WRITE(7,110)NPAN,SREF,CBAR,XBAR,ZBAR,WSPAN	VORTAB	1319
110 FORMAT(I2,8X,5F10.3)	VORTAB	1320
RETURN	VORTAB	1321
END	VORTAB	1322
C	VORTAB	1323

SUBROUTINE PRINTC(N,WHERE)	VORTAB	1324
C ** ALLOWS A QUESTION TO BE ANSWERED WITH YES OR NO,	VORTAB	1325
C ** OR, TRUE OR FALSE, OR ANYTHING LESS THEN 16 CHARACTERS	VORTAB	1326
C ** THAT STARTS WITH Y,T,N, OR F.	VORTAB	1327
INTEGER WHERE	VORTAB	1328
DIMENSION ANSER(15)	VORTAB	1329
PRINT *, "DO YOU WANT TO RE-ENTER THE DATA FOR CARD ",N	VORTAB	1330
PRINT *, "ENTER Y OR T FOR YES, OR N OR F FOR NO,"	VORTAB	1331
4 READ (1,1) ANSER	VORTAB	1332
IF(EOF(1))4,5	VORTAB	1333
1 FORMAT(15A1)	VORTAB	1334
5 ANS=ANSER(1)	VORTAB	1335
IF(ANS.EQ.1HT)GO TO 2	VORTAB	1336
IF(ANS.EQ.1HY)GO TO 2	VORTAB	1337
IF(ANS.EQ.1HN)GO TO 3	VORTAB	1338

APPENDIX B. - Continued

IF(ANS.EQ.1HF)GO TO 3	VORTAB	1339
PRINT *, "RE-ENTER YOUR ANSWER LEFT JUSTIFIED."	VORTAB	1340
GO TO 4	VORTAB	1341
C ** YES	VORTAB	1342
2 WHERE=1	VORTAB	1343
RETURN	VORTAB	1344
C ** NO	VORTAB	1345
3 WHERE=-1	VORTAB	1346
RETURN	VORTAB	1347
END	VORTAB	1348
C	VORTAB	1349
SUBROUTINE LAST3	VORTAB	1350
C ** THIS IS USED TO GENERATE THE LAST 3 CARDS #'S 19, 20, & 21.	VORTAB	1351
DIMENSION XS(20)	VORTAB	1352
INTEGER WHERE	VORTAB	1353
PRINT *, "THE DATA FOR THE LAST 3 CARDS IS INPUT NEXT,"	VORTAB	1354
PRINT *, "THESE CARDS ARE NUMBERED 19, 20, AND 21."	VORTAB	1355
C ** CARD NUMBER 19.	VORTAB	1356
PRINT *, "ENTER DATA FOR CARD NUMBER 19."	VORTAB	1357
1 PRINT *, "NUMBER OF X-STATIONS TO DEFINE SPATIAL FLOW FIELD"	VORTAB	1358
PRINT *, "SURVEY GRID < 21, (NXS)"	VORTAB	1359
50 READ (1,*)NXS	VORTAB	1360
IF(EOF(1))50,51	VORTAB	1361
51 IF(NXS.GT.20)GO TO 1	VORTAB	1362
IF(NXS.GT.0)GO TO 2	VORTAB	1363
NYS=NZS=0	VORTAB	1364
GO TO 10	VORTAB	1365
2 PRINT *, "NUMBER OF Y-STATIONS TO DEFINE THE BUTT LINE"	VORTAB	1366
PRINT *, "VALUES OF THE SURVEY GRID (NYS)"	VORTAB	1367
52 READ (1,*)NYS	VORTAB	1368
IF(EOF(1))52,53	VORTAB	1369
53 PRINT *, "NUMBER OF Z-STATIONS TO DEFINE THE WATER LINE"	VORTAB	1370
PRINT *, "VALUES OF THE SURVEY GRID (NZS)"	VORTAB	1371
54 READ (1,*)NZS	VORTAB	1372

APPENDIX B. - Continued

IF(EOF(1))54,10	VORTAB	1373
10 CALL PRNTC(19,WHERE)	VORTAB	1374
IF(WHERE)11,11,1	VORTAB	1375
11 WRITE(4,100)NXS,NYS,NZS	VORTAB	1376
100 FORMAT(3(I2,8X))	VORTAB	1377
IF(NXS.GT.0)GO TO 9	VORTAB	1378
PRINT *,"EXECUTION OF THE PROGRAM IS COMPLETED"	VORTAB	1379
RETURN	VORTAB	1380
C ** CARD NUMBER 20.	VORTAB	1381
9 PRINT *," ENTER THE DATA FOR CARD NUMBER 20"	VORTAB	1382
5 PRINT *,"X-STATION VALUES FOR SPATIAL FLOW FIELD (XS)"	VORTAB	1383
DO 30 JJ=1,NXS	VORTAB	1384
PRINT *,"ENTER X-STATION NUMBER ",JJ	VORTAB	1385
31 READ (1,*)XS(JJ)	VORTAB	1386
IF(EOF(1))31,30	VORTAB	1387
30 CONTINUE	VORTAB	1388
55 CALL PRNTC(20,WHERE)	VORTAB	1389
IF(WHERE)20,20,5	VORTAB	1390
20 WRITE(4,101)(XS(J),J=1,NXS)	VORTAB	1391
101 FORMAT(8F10.3)	VORTAB	1392
C ** CARD NUMBER 21.	VORTAB	1393
40 PRINT *,"ENTER DATA FOR CARD NUMBER 21"	VORTAB	1394
PRINT *,"BEGINNING OF GRID IN BUTT LINE DIRECTION (YNOT)"	VORTAB	1395
56 READ (1,*)YNOT	VORTAB	1396
IF(EOF(1))56,57	VORTAB	1397
57 PRINT *,"Y-SPACING OF THE GRID (DELTAY)"	VORTAB	1398
58 READ (1,*)DELTAY	VORTAB	1399
IF(EOF(1))58,59	VORTAB	1400

APPENDIX B. - Concluded

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59 PRINT *, "BEGINNING OF GRID IN WATER LINE DIRECTION (ZNOT)"
60 READ (1,*)ZNOT
   IF (EOF(1))60,61
61 PRINT *, "Z-SPACING OF THE GRID (DELTAZ)"
62 READ (1,*)DELTAZ
   IF (EOF(1))62,63
63 CALL PRINTC(21,WHERE)
   IF (WHERE)41,41,40
41 WRITE(4,101)YNOT,DELTAY,ZNOT,DELTA7
   PRINT *, "EXECUTION OF THE PROGRAM IS COMPLETED"
   RETURN
   END
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VORTAB	1401
VORTAB	1402
VORTAB	1403
VORTAB	1404
VORTAB	1405
VORTAB	1406
VORTAB	1407
VORTAB	1408
VORTAB	1409
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VORTAB	1411
VORTAB	1412

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16. Abstract A method of developing an input data file for use in the aerodynamic analysis of a complete airplane with the VORLAX computer program is described. Familiarity with VORLAX input data and panelling methods is assumed. The required hardware consists of an interactive graphics terminal equipped with a graphics tablet. Software includes graphics routines from the Tektronix PLOT 10 package as well as the VORTAB program described herein. The user must determine the size and location of each of the major panels for the aircraft before using the program. Data is entered both from the terminal keyboard and the graphics tablet. The size of the resulting data file is dependent on the complexity of the model and can vary from ten to several hundred card images. After all of the data has been entered, two programs READB and PLOTB, are executed which plot the configuration allowing visual inspection of the model.					
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